




CERTIFICATE OF TRANSLATION

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certify that to the best of my knowledge and belief the attached English
translation is a true and correct translation of the original document –
Japanese Patent Application No. 2002-375032 – made by me.

This 6th day of July, 2006


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[Name of the Document] Specification
[Title of the Invention] Occupant Protection Device
[Claims]
[Claim 1]

An occupant protection device comprising a knee-protecting airbag device located in front of an occupant seated in a front passenger's seat for protecting the occupant's knees in the event of collision of the vehicle, and a container box located above the knee-protecting airbag device for housing goods,

the knee-protecting airbag device comprising an airbag inflatable for protecting the occupant's knees, an inflator for supplying inflation gas to the airbag, a case for housing the folded airbag and the inflator, the case being opened rearward, and an airbag cover for covering an opening of the case, the airbag cover being attached to the case and openable upon inflation of the airbag,

the container box comprising a box body opened rearward and a lid for openably covering an opening of the box body, wherein:

before being mounted on the vehicle, the knee-protecting airbag device and the container box are assembled into a mounting module in advance; and

by mounting the module on the vehicle, the knee-protecting airbag device and the container box are mounted on the vehicle.

[Claim 2]

The occupant protection device according to claim 1, wherein the box body is supported at a lower surface thereof by a support section formed in the case.

[Claim 3]

The occupant protection device according to claim 2, wherein:

the case comprises a joint section to be joined with a vehicle body; and

the box body is secured to the vehicle body by being joined to the case.

[Claim 4]

The occupant protection device according to any one of claim 1 to claim 3, wherein the box body and the airbag cover are formed of a single-piece molded part of synthetic resin.

[Claim 5]

The occupant protection device according to any one of claim 1 to claim 4, wherein the mounting module further comprises an airbag device for a front passenger's seat having an airbag for protecting an upper body of the occupant.

[Claim 6]

The occupant protection device according to any one of claim 1 to claim 5, wherein the mounding module further comprises an interior decoration member located in front of the front passenger's seat.

[Detailed Description of the Invention]

[0001]

[Technical Field of the Invention]

The present invention relates to a vehicle occupant protection device located in front of a front passenger's seat for protecting knees of an occupant seated in the front passenger's seat.

[0002]

[Description of Related Art]

In the prior art, the patent publication 1, for example, shows a device for protecting knees of a vehicle occupant seated in a front passenger's seat which device includes an inflatable airbag for

protecting occupant's knees.

[0003]

[Patent Publication 1]

JP 8-80797 A

[0004]

[Problems to be solved by the invention]

However, there is conventionally disposed a container box (or glove box) for housing a map and so on in front of the front passenger's seat.

[0005]

If it is desired that the knee-protecting airbag device and the container box are both located in front of the front passenger's seat, individual parts have to be mounted on the vehicle separately, which would increase a tact time per vehicle.

[0006]

The present invention contemplates to solve above problem, and therefore, has an object to provide an occupant protection device capable of preventing the tact time per vehicle from increasing even if the container box is mounted in front of the front passenger's seat while the device aims to protect knees of the occupant seated in the front passenger's seat.

[0007]

The occupant protection device of the present invention includes a knee-protecting airbag device located in front of an occupant seated in a front passenger's seat for protecting the occupant's knees in the event of collision of the vehicle, and a container box located above the knee-protecting airbag device for housing goods. The knee-protecting airbag device includes an airbag inflatable for protecting

the occupant's knees, an inflator for supplying inflation gas to the airbag, a case for housing the folded airbag and the inflator, the case being opened rearward, and an airbag cover for covering an opening of the case, the airbag cover being attached to the case and openable upon inflation of the airbag. The container box includes a box body opened rearward and a lid for openably covering an opening of the box body. Before being mounted on the vehicle, the knee-protecting airbag device and the container box are assembled into a mounting module in advance. By mounting the module on the vehicle, the knee-protecting airbag device and the container box are mounted on the vehicle.

[0008]

In the occupant protection device of the present invention, the knee-protecting airbag device and the container box are assembled in advance into a mounting module. Accordingly, the knee-protecting airbag device and the container box are mounted on the vehicle at one time by attaching the module to the vehicle, which conduces to work improvement, and reduce the tact time per vehicle, compared with a case of mounting the knee-protecting airbag device and the container box separately.

[0009]

Of course, if the knee-protecting airbag device is actuated, the airbag inflates with inflation gas from the inflator. The airbag then pushes open the airbag cover and protrudes from the case to protect the knees of the occupant.

[0010]

Therefore, the occupant protection device of the present invention contributes to prevent the tact time per vehicle from increasing even if the container box is mounted in front of the front passenger's seat

while the device aims to protect knees of an occupant seated in the front passenger's seat.

[0011]

Moreover, if the knee-protecting airbag device and the container box are integrally assembled before being mounted on the vehicle, there is a freedom in the assembling direction to each other, and a simple assembling means can be employed. In addition, the above arrangement requires less extra space in the mounting direction which would be required in mounting the knee-protecting airbag device and the container box separately, so that more interior space is secured in front of the front passenger's seat.

[0012]

The box body is desirably supported at its lower surface by a support section formed in the case.

[0013]

With this arrangement, the lower surface of the box body is securely supported by the support sections since the case is rigid so the inflating airbag protrude from an opening of the case smoothly, and is secured to the vehicle body tightly. Accordingly, even if heavy objects are housed in the boxy body, the box body is prevented from deforming, and thus is able to keep good appearance.

[0014]

In this case, if the case includes a joint section to be joined with a vehicle body, and the box body is secured to the vehicle body by being joined to the case, the container box is secured to the body by joining the joint section extending from the case to the body in mounting the mounting module on the vehicle, thus omitting a fixing work of the box to the body. Here, since the case is rigid so the inflating

airbag protrude from the opening of the case smoothly, and is secured to the vehicle body tightly, the container box is stably secured to the body via the case.

[0015]

The box body and the airbag cover may be formed of a single-piece molded part of synthetic resin.

[0016]

With this arrangement, the number of components of the mounting module is reduced, and the mounting work of the module itself is simplified.

[0017]

The mounting module may further include an airbag device for a front passenger's seat having an airbag for protecting an upper body of the occupant.

[0018]

This arrangement will conduce to work improvement, and reduce the tact time per vehicle, compared with a case of mounting the knee-protecting airbag device, the container box and the airbag device for a front passenger's seat separately. Moreover, mounting workability of components arranged in front of the front passenger's seat (the knee-protecting airbag device, the container box and the airbag device) is improved, too.

[0019]

If the mounting module further includes an interior decoration member to be located in front of the front passenger's seat, the general mounting work will be improved and the tact time per vehicle will be reduced, compared with a case of mounting the knee-protecting airbag device, the container box and the interior decoration member separately.

Moreover, mounting workability of components arranged in front of the front passenger's seat (the knee-protecting airbag device, the container box and the interior decoration member) is improved, too. Of course, since these components (the knee-protecting airbag device, the container box and the interior decoration member) are assembled into a single piece before being mounted on the vehicle, less extra space in the mounting direction will be required in comparison with a case where the components are mounted separately, so that more interior space is secured in front of the front passenger's seat. In this case, the mounting module may alternatively include an airbag device for a front passenger's seat.

[Means of Solving the Problem]

[0020]

[Mode for Carrying out the Invention]

An embodiment of the present invention will be described with reference to drawings. As shown in Figs. 1 to 3, a first embodiment S1 of the vehicle occupant protection device according to the present invention includes a knee-protecting airbag device 11 and a container box 60. The knee-protecting airbag device 11 is located in front of an occupant M seated in a front passenger's seat PS for protecting knees K (KL and KR) of the occupant M in the event of a collision of a vehicle. The container box 60 is located above the knee-protecting airbag device 11 for containing goods.

[0021]

Front, rear, left and right in this specification are based on a condition where the occupant protection device is mounted on a vehicle, and are consistent with front, rear, left and right of the vehicle.

[0022]

In the occupant protection device S1, the knee-protecting airbag

device 11 and the container box 60 are preliminarily assembled together to form an integral mounting module 10. The occupant protection device S1 is mounted on the vehicle by attaching the module 10 to vehicle body 1.

[0023]

Located in front of the front passenger's seat PS is an instrument panel 6 as an interior decoration member. Below the instrument panel 6 (as will be called dashboard below), a lid 73 of the container box 60 is arranged in such a manner as to continue from a back surface of the dashboard 6. An airbag cover 44 of the knee-protecting airbag device 11 is arranged below the lid 73 continuously from a back surface of the lid 73.

[0024]

In the first embodiment, there is located an airbag device 80 for a front passenger's seat above the dashboard 6 for protecting a breast and so on of an upper body MU of the occupant M in the event of a frontal collision of vehicle. The airbag device 80 for a front passenger's seat includes an inflatable airbag 91 for protecting a breast and so on of the upper body MU of the occupant M, an inflator 87 for feeding the airbag 91 with inflation gas, an airbag cover 95 for covering the folded airbag 91, and a case 81 for containing the folded airbag 91 and the inflator 87 and holding the airbag cover 95.

[0025]

As referred to Fig. 3, the airbag 91 is attached to a bottom wall 83 of the case 81 while being held at a periphery of its opening 91a for inletting inflation gas from the inflator 87 by a retainer 92 having generally cylindrical shape. The retainer 92 is provided at its four corners with bolts 92a extending downward, and the bolts 92a are fastened

into nuts 93. The inflator 87 includes a cylindrical main body 88 having gas discharge ports 88a in its upper side and a flange 89 extending from an outer circumference of the main body 88. The inflator 87 is attached to the case bottom wall 83 by inserting the bolts 92a of the retainer 92 through the opening 91a periphery of the airbag 91, the flange 89 and the case bottom wall 83 and fastening them into the nuts 93.

[0026]

The case 81 is made of sheet metal into a generally rectangular parallelepiped box shape. The case 81 includes a bottom wall 83 for inserting the main body 88 of the inflator 87 therethrough, and a circumferential wall portion 82 extended upward from an outer circumferential edge of the bottom wall 83 to have a generally square cylindrical shape. The circumferential wall portion 82 is provided with hooks 82a for holding the airbag cover 95. The case 81 is further provided with a bracket 84 for securing the airbag device 80 to a dashboard reinforcement 2. The bracket 84 is bolt 85 fixed to a bracket 2a extended from the dashboard reinforcement 2. The bolt 85 is fastened with a nut 2b fixed to the bracket 2a.

[0027]

The airbag cover 95 is made from synthetic resin, and includes a ceiling wall 96 and a side wall portion 98 extending downward from the ceiling wall 96. The side wall portion 98 is to be joined with the circumferential wall portion 82 of the case 81. The side wall portion 98 is provided with retaining holes 98a to be hooked at the periphery by the hooks 82a of the circumferential wall portion 82. The ceiling wall 96 is adapted to cover over the airbag 91 folded and housed in the case 81, and includes two doors 97 to be pushed open by the airbag

91 upon deployment. As referred to Fig. 1, these two doors 97 are provided therearound with a thinned breakable portion 96b having a substantially H-shape as viewed from above. When pushed by the airbag 92, the doors 97 break the breakable portion 96b and open in front and rear directions, respectively. The ceiling wall 96 further includes a plurality of fastening legs 96a to be fastened at an opening 6a periphery of the dashboard 6.

[0028]

Referring to Figs. 3 to 5, 7, 8 and 12, the knee-protecting airbag device 11 in the occupant protection device S1 according to the first embodiment includes a folded airbag 39, an inflator 31 for feeding the airbag 39 with inflation gas, a case 12 opened rearward for containing the folded airbag 39 and the inflator 31, and an airbag cover 44 for covering the vehicle's rear side of the case 12.

[0029]

As referred to Figs. 5, 7 and 8, the inflator 31 is a cylinder-type arranged so that its axial direction may be along the vehicle's left-right direction. The inflator 31 includes a substantially columnar body 32 and a diffuser 33. The body 32 includes a substantially columnar general portion 32a and a small diameter portion 32b projected from an end face of the general portion 32a. There are formed a plurality of gas discharge ports 32c on the outer circumference of the small diameter portion 32b. A connector 36 to which a lead wire 37 is connected for inputting actuating signals is connected to the other end face of the general portion 32a away from the small diameter portion 32b. The diffuser 33 has a substantially cylindrical shape for covering the inflator body 32. The diffuser 33 is provided at the rear side as mounted on the vehicle with a plurality of gas outlet ports 33a for emitting inflation gas. The

diffuser 33 further includes a plurality (two, in the foregoing embodiment) of bolts 33d protruded forward of the vehicle, and a plurality of clamping portions 33c for holding the body 32. To attach the inflator body 32 to the diffuser 33, the body 32 is inserted into the diffuser 33 through an insert hole 33b, from the small diameter portion 32b. Then each of the clamping portions 33c is plastically deformed and pressed onto the outer circumference of the general portion 32a. Thus the body 32 is secured to the diffuser 33. If each of the bolts 33d is inserted into a through hole 17a of bottom wall 17 of the case 12, and then nut 34 is fastened with the bolt 33d, the inflator 31 is secured to the case 12.

[0030]

The inflator 31 is actuated by an actuating signal inputted through the lead wire 37 when an airbag actuating circuit mounted on the vehicle detects a frontal collision of the vehicle. When the actuating circuit detects a frontal collision of the vehicle, the inflator 87 of the airbag device 80 for a front passenger's seat also receives an actuating signal simultaneously.

[0031]

The airbag 39 is formed of flexible woven fabric of polyester, polyamide or the like, and takes a substantially rectangular plate shape as deployed completely, as indicated by double-dotted lines in Figs. 1 to 3. The airbag 39 is transversely wide enough to protect both knees KL and KR of the occupant M. The airbag 39 is configured to locate its occupant's side wall 40 toward the occupant M, and locate its vehicle body side wall 41 toward the container box 60 when completely deployed. The wall portions 40 and 41 have substantially the same shapes. The airbag 39 is provided in a portion 42 in the vehicle body side wall

41 or at its lower end region as completely deployed with insert holes 42a and an insert hole 42b. The insert holes 42a are for inserting through the individual bolts 33 of the inflator 31, and the insert hole 42b is for inserting through the body 32 of the inflator 31. The airbag 39 is attached to the case 12 with the body 32 of the inflator 31 protruded from the insert hole 42b, and with the periphery of the individual insert holes 42a clamped by the diffuser 33 and the bottom wall 17 of the case 12. In other words, the airbag 39 is secured to the bottom wall 17 of the case 12 by the periphery of the insert holes 42a serving as a mounting portion 42.

[0032]

Referring to Figs. 4, 7, 8 and 12, the case 12 is made of sheet metal and includes a box-shaped body 13 and a panel portion 18 extending outward from a rear end of the body 13. The body 13 includes a circumferential wall portion 14 having a substantially square cylindrical shape, a bottom wall 17 closing vehicle's front side of the circumferential wall portion 14, and an opening 13a opened in substantially rectangular shape at the vehicle's rear side. The circumferential wall portion 14 is provided on the outer surfaces of its walls 14a and 14b confronting each other in the vertical direction with a plurality of retainers 15 (15U and 15D) for attaching upper and lower joint walls 47 and 48 of the airbag cover 44 to the case 12.

[0033]

Referring to Fig. 12, each of the retainers 15U located on the outer surface of the upper wall 14a is formed into a hook shape having substantially Z-shaped section, and is adapted to be inserted into the retaining hole 47a formed on the upper joint wall 47 of the airbag cover 44 and retained thereat. The hooks 15U are located in a plurality of

positions (four positions, in the foregoing embodiment) along the transverse direction of the vehicle on the wall 14a.

[0034]

Each of the retainers 15D located on the outer surface of the lower wall 14b is formed into a projection shape having a substantially U-shaped section, and is adapted to be inserted into the retaining hole 48a of lower joint wall 48 of the airbag cover 44. The projections 15D are located in a plurality of positions (four positions, in the foregoing embodiment, refer to Fig. 12) along the transverse direction of the vehicle on the wall 14b. A locking member 16 is inserted into the projections 15D for preventing the projections 15D from coming off from the retaining holes 48a. The locking member 16 includes four bars 16a to be inserted in between the outer surface of the lower joint wall 48 and inner circumferences of the individual projections 15D. The four bars are integrated at the vehicle's front side and secured to the case 12. The locking member 16 is secured to the bottom wall 17 of the case 12 together with the inflator 31 when the inflator 31 is fixed to the case 12 by means of bolt 33d and nut 34.

[0035]

As shown in Fig. 8, the side wall 14c in the circumferential wall portion 14 has an insert hole 14d for inserting through the end of the body 32 of the inflator 31. In the bottom wall 17, there are formed two insert holes 17a for inserting through the bolts 33d of the inflator 31.

[0036]

The panel portion 18 has a substantially flat plate shape elongated in the transverse direction to encircle the opening 13a of the case 12. Here, the case 12 shown in Fig. 12 is constructed by welding two

members of a box member 12a and a panel member 12b. The panel member 12b constitutes the panel portion 18, and includes the retainers 15U and 15D to be located on the outer surface of the circumferential wall portion 14 of the body 13. The case 12 is formed of two members of the box member 12a and the panel member 12b so as to reduce kinds of components used for the knee protecting airbag device for a front passenger's seat and a knee protecting airbag device for a driver's seat to be mounted on a vehicle. That is, the box member 12a of the case 12 and the inflator 31 are also used for the knee-protecting airbag device for a driver's seat, whereas the panel member 12b and the airbag cover 44 are so configured as to fit in their arrangement positions.

[0037]

The case 12 includes a support section 20 formed in an upper edge region of the panel portion 18, and a support section 21 fixed to a front side of the bottom wall 17 of the body 13. The support sections 20 and 21 are adapted to abut against a lower surface 64a of a lower wall 64 in a box body 61 of the container box 60, and support the lower wall 64 of the box body 61. The support section 20 supports a substantially entire area of a rear end part of the lower surface 64a of the lower wall 64 except the left and right ends, and the support section 21 supports a substantially entire area of a front end part of the lower wall lower surface 64a except the left and right ends. The support section 20 is formed by extending a transversely central part of the upper edge of the panel portion 18 upward, and the support section 21 is composed of a bracket 22 of sheet metal having a vertically inverted-J shaped section as taken along the front-rear direction of the vehicle and welded to the bottom wall 17.

[0038]

The case 12 further includes each two fixers 23 and 24 for fixing the box body 61 of the container box 60. As shown in Figs. 4, 10 and 12, the fixers 23 are located in the panel portion 18 to fix fixing pieces 71 disposed in left and right lower ends of a flange 69 positioned in a rear end of the box body 61 by means of tapping bolts 25. Each of the fixers 23 is provided with a hole 23a for screwing the bolt 25 into. Referring to Figs. 7 and 12, the fixers 24 are located in the bracket 22 to fix fixing pieces 67 projected downward from the vicinities of left and right lower ends of the lower wall 64 of the box body 61 by means of tapping bolts 25. Each of the fixers 24 is provided with a hole 24a for screwing the bolt 25 into.

[0039]

As referred to Figs. 4, 9 and 12, the case 12 includes three joint sections 26 for securing the airbag device 11 to the vehicle body 1. The joint sections 26 are located in positions away from the body 13 in the panel portion 18, and includes joint sections 26A and 26B located in the vicinities of left and right upper edge, respectively, and a joint section 26C located toward right side in the lower edge. Each of the joint sections has a joint hole 26a for inserting a bolt 27 thereinto. The joint sections 26 are bolt 27 fixed to brackets 3 extending from a center brace or a side member of the vehicle body 1, thereby serving to secure the airbag device 11 to the vehicle body 1. Each of the brackets 3 in advance has a nut 3a fixed thereto for screwing the bolt 27 thereinto.

[0040]

As shown in Figs. 11 and 12, the panel portion 18 of the case 12 in the first embodiment is further provided at two positions with pivot sections 28 for supporting a lid 73 of the container box 60 such that the lid 73 may pivotally rotate thereupon when opened and closed.

Each of the pivot sections 28 supports each of hinge arms 74 located in left and right sides of the lower edge of the lid 73 in a swingable manner by means of a pin 29.

[0041]

Moreover, as referred to Figs. 4 and 12, the panel portion 18 of the case 12 is provided at four positions in the upper periphery of the opening 13a with apertures 18a for inserting the upper joint wall 47 of the airbag cover 44, and at two positions near left and right edges with apertures 18b for retaining retaining legs 46 of the airbag cover 44. Third apertures 18c shown in Figs. 4 and 12 are adapted to retain not-shown retaining legs of an undercover 4. Slits 18d shown in Figs. 4 and 8 are for inserting left and right side walls 49 of the airbag cover 44 therethrough.

[0042]

The airbag cover 44 is made from thermo-plastic elastomer of polyolefin or the like, and is joined to and supported by the case 12 for covering the vehicle's rear side of the folded airbag 39 and the case 12. The airbag cover 44 includes two doors 52 for covering the opening 13a of the case 12 at the rear side of the vehicle, and a general section 45 located around the doors 52.

[0043]

The two doors 52 are formed in a substantially rectangular plate shape, and are provided therearound with a thinned breakable portion 51 of a substantially H-shape as viewed from the vehicle's rear side, as shown in Fig. 1. The breakable portion 51 is so provided at its vehicle's front side face with continuous or intermittent grooves as to easily break when the doors 52 are pushed by inflating airbag 39. Thus the doors 52 are configured to open upward and downward if the

breakable portion 51 breaks when pushed by inflating airbag 39.

[0044]

In the general section 45, there are formed four walls 47, 48, 49 and 49 protruded forward of the vehicle to neighbor the circumferential wall portion 14 of the case 12. The four walls are located proximate to the doors 52 peripheries and outward of the circumferential wall portion 14 of the case 12, as shown in Figs. 5, 7, 8 and 12. The upper joint wall 47 located above the case circumferential wall 14 and the lower joint wall 48 located below the wall 14 serve to join the airbag cover 44 to the case 12. The walls 47 and 48 include retaining holes 47a and 48a, respectively, such that the retainers 15 (15U and 15D) of the circumferential wall portion 14 are inserted and retained thereat.

[0045]

The general section 45 further includes retaining legs 46 at left and right sides in the lower edge. The retaining legs 46 are protruded forward of the vehicle to be inserted into the apertures 18b of the panel portion 18 and retained by the panel portion 18, as shown in Figs. 10 and 11.

[0046]

The container box 60 includes a box body 61 opened rearward of the vehicle, and an openable lid 73 for covering an opening 61a of the box body 61, and is made from hard synthetic resin such as polypropylene.

[0047]

As shown in Figs. 4 to 6 and 12, the box body 61 includes a bottom wall 66 positioned at the vehicle's front side and apart from the opening 61a, a circumferential wall portion 62 extending rearward of the vehicle from the bottom wall 66 periphery in a substantially square cylindrical shape, and a flange 69 extending up, left and rightwards from the periphery

of the opening 61a of the circumferential wall portion 62. The circumferential wall portion 62 includes an upper wall 63 positioned in an upper side, a lower wall 64 positioned in a lower side, and left and right side walls 65 joining the upper and lower walls 63 and 64.

[0048]

From left and right front edge of the lower wall 64 are protruded downward fixing pieces 67 to be fixed to the fixers 24 of the case 12. Each of the fixing pieces 67 is provided with a fixing hole 67a for inserting through the bolt 25. As shown in Fig. 9, the lower wall 64 is further provided with a detachable cap 64b for putting in the bolts 27 and fixtures used in the bolt 27 fixing of the joint sections 26A and 26B of the case 12 to the bracket 3 of the vehicle body 1.

[0049]

As shown in Figs. 11 and 12, the flange 69 is provided in its left and right regions in the lower edge with through holes 69a for inserting the left and right hinge arms 74 of the lid 73. Near the hole 69a, as shown in Figs. 10 and 12, are fixing pieces 71 protruding downward to be fixed to the fixers 23 of the case 12. Each of the fixing pieces 71 has a fixing hole 71a for inserting the bolt 25. In the upper edge of the flange 69, as shown in Figs. 5 and 12, there is protruded upward a joint piece 70 to be joined to a lower edge 7a of the dashboard body 7. The joint piece 70 includes joint holes 70a for inserting bolts 72 to be screwed into the body 7, and retaining legs 70b to be retained by the body 7.

[0050]

As referred to Figs. 11 and 12, the lid 73 is provided at its left and right lower edge in the vehicle's front side face with hinge arms 74 projected forward of the vehicle. The hinge arms 74 are inserted

through the through holes 69a of the flange 69 in the box body 61 and joined with the pivot sections 28 of the case 12 in a swingable manner, such that the upper edge 73a of the lid 73 rotates in front-rear direction. The hinge arms 74 include a not-shown damper mechanism such that opening/closing action of the lid 73 may not be performed too rapidly. The lid 73 is position-restricted by abutting against the flange 69 of the box body 61 when closed, and when opened, it is position-restricted by the damper mechanism.

[0051]

Assembly of the knee-protecting airbag device 11 is now described. Firstly, the inflator 31 preliminarily assembled by the body 32 and the diffuser 33 is put in the airbag 39 so that the bolts 33d are protruded from the insert holes 42a and the end of the inflator body 32 is protruded from the insert hole 42b, and then the airbag 39 is folded up. Subsequently, the airbag 39 is wrapped around by a not-shown breakable wrapping film for keeping the folded-up shape. At this time, the bolts 33d and the end of the body 32 of the inflator 31 protruded from the insert holes 42a and 42b are taken out from the wrapping film. Here, other than a resin sheet member, a cloth member such as the woven fabric used to form the airbag 39, a tape member or a string member may be employed as the wrapping film.

[0052]

Thereafter, the inflator 31 is housed in the case 12 together with the folded airbag 39, so that the individual bolts 33d of the inflator 31 are protruded from the insert holes 17a, and the end of the inflator body 32 is protruded from the insert hole 14d. By further fastening not-shown spring nuts with the individual bolts 33d from the front side of the bottom wall 17, the inflator 31 and the airbag 39 are housed

in and attached to the case 12.

[0053]

Then the airbag cover 44 is assembled with the case 12. More specifically, the walls 47, 48 and 49 of the airbag cover 44 are located around the case circumferential wall portion 14 in regions toward the opening 13a. At this time, the individual retaining hooks 15U are so inserted into the retaining holes 47a of the upper joint wall 47 as to be retained at peripheries of the retaining holes 47a on an upper surface of the upper joint wall 47. On the other hand, the individual retaining projections 15D are inserted into the retaining holes 48a of the lower joint wall 48, and the retaining legs 46 are so inserted into the apertures 18b as to be retained at the apertures 18b peripheries. Then the bars 16a of the locking member 16 are inserted between the outer surface of the lower joint wall 48 and the inner circumferences of the individual projections 15D, the individual bolts 33d of the inflator 31 are inserted through the locking member 16, and the nuts 34 are fastened with the bolts 33d. Thus the knee-protecting airbag device 11 is assembled. Here, a connector 36 having the lead wire 37 connected thereto is preliminarily joined with the inflator body 32.

[0054]

Assemblage of the module 10 is started by making the lower surface 64a of the lower wall 64 of the box body 61 abut against the individual support sections 20 and 21 of the case 12 of the assembled knee-protecting airbag device 11. Then the fixing holes 23a, 24a of the individual fixers 23 and 24 are matched with corresponding fixing holes 67a and 71a of the individual fixing pieces 67 and 71. By screwing the bolts 25 into the fixing holes 23a and 24a through the fixing holes 71a and 67a, the box body 61 is secured to the case 12.

[0055]

Subsequently, the holes 74a in the individual hinge arms 74 of the lid 73 are located at the pivot sections 28 of the case 12 through the through holes 69a of the box body 61, and the pins 29 are inserted into the holes 74a and pivot sections 28, so that the lid 73 is assembled with the box body 61 so as to open and close the opening 61a of the box body 61. Thus the container box 60 is assembled, and the module 10 is formed, as shown in Fig. 13. At this time, the not-shown damper mechanism is mounted on the module 10, too.

[0056]

In the occupant protection device S1 according to the first embodiment, the main body 7 of the dashboard 6 and the airbag device 11 for a front passenger's seat have been preliminarily mounted on the vehicle before the module 10 is mounted on the vehicle. To mount the module 10 on the vehicle, the individual joint sections 26A, 26B and 26C in the case 12 of the airbag device 11 are firstly located at predetermined brackets 3 of the vehicle body 1, and the joint piece 70 of the container box 60 is applied to the lower edge 7a of the dashboard body 7. At this time, the retaining legs 70b of the joint piece 70 are inserted into predetermined positions of the dashboard lower edge 7a and retained thereat.

[0057]

Subsequently, the individual bolts 27 are fastened into the nuts 3a via the individual joint holes 26a. The fixing of the bolts 27 in the joint sections 26A and 26B is done with the lid 73 and the cap 64b opened. After fixing the bolts 27, the cap 64b is relocated and then the lid 73 is closed. In the joint section 26C, the bolt 27 is easily fixed since an under cover 4 has not yet been mounted at this point.

[0058]

By then fastening the bolts 72 to the lower edge 7a of the dashboard body 7 via the joint holes 70a of the joint piece 70, attaching a decoration cover 8 to the body 7, and by mounting the under cover 4, the mounting of the module 10 on the vehicle is completed. The terminal of the lead wire 37 is connected to the airbag actuating circuit.

[0059]

After mounting the module 10 on the vehicle, when an actuating signal is input to the body 32 of the inflator 31 via the lead wire 37, inflation gas is discharged from the gas discharge ports 32c of the inflator 31, and flows into the airbag 39 via the gas outlet ports 33a of the diffuser 33. Then the airbag 39 inflates and breaks the wrapping film, pushes the doors 52 of the airbag cover 44, and breaks the breakable portion 51 to open the doors 52 up and downwards. As indicated by double-dotted lines in Figs. 1 to 3, the airbag 39 then protrudes rearward from the opening 54 provided by the opening of the doors 52, and further protrudes upward along the rear surface of the lid 73 while expanding and inflating. Accordingly, even if the occupant M seated in the front passenger's seat PS advances, the inflated airbag 39 is able to protect the knees K properly. At this time, since the airbag device 80 for front passenger's seat is actuated, too, the airbag 91 inflates, pushes open the doors 97 in front and rear directions, and protrudes from the case 81 to protect the upper body MU of the occupant M, as indicated by double-dotted lines in Figs. 2 and 3.

[0060]

In the occupant protection device S1 of the first embodiment, the knee-protecting airbag device 11 and the container box 60 are assembled together in advance to form the module 10. Accordingly, the

knee-protecting airbag device 11 and the container box 60 are mounted on the vehicle at one time by mounting the module 10 on the vehicle, which conduces to work improvement, and reduce the tact time per vehicle, compared with a case of mounting the knee-protecting airbag device 11 and the container box 60 separately.

[0061]

Of course, if the knee-protecting airbag device 11 is actuated, the airbag 39 inflates and protects the knees K of the occupant M.

[0062]

Therefore, the occupant protection device S1 of the first embodiment contributes to prevent the tact time per vehicle from increasing even if the container box 60 is mounted in front of the front passenger's seat PS while the device aims to protect knees K (KL and KR) of the occupant M seated in the front passenger's seat PS.

[0063]

In the first embodiment, the knee-protecting airbag device 11 and the container box 60 are integrally assembled before being mounted on the vehicle. Accordingly, there is a freedom in the assembling direction to each other, and a simple assembling means can be employed. In the foregoing embodiment, the fixing pieces 71 and 67 of the box 60 are applied to the fixers 23 and 24 of the case 12 from the vehicle's front side so the bolts 25 be fastened from the vehicle's front side. Thus, it is possible to adopt an assembling direction which would not be chosen in a case of mounting the knee-protecting airbag device 11 and the container box 60 separately, while securing a predetermined assembling strength. In the foregoing embodiment, moreover, the case 12 of the airbag device 11 and the body 61 of the container box 60 are coupled to each other by fastening the tapping bolts 25 to the fixing

holes 23a and 24a which fixing holes are formed by cutting and raising sheet metal region of the case 12 by mere burring work, instead of applying female thread cutting. Thus, predetermined assembling strength is secured by a simple assembling means.

[0064]

Since the knee-protecting airbag device 11 and the container box 60 are assembled together before being mounted on the vehicle, less extra space is needed in the mounting direction which would otherwise be required where the knee-protecting airbag device 11 and the container box 60 are mounted separately. Consequently, more interior space is secured in front of the front passenger's seat.

[0065]

In the first embodiment, moreover, the box body 61 is abutted on and supported at its lower surface 64a of the lower wall 64 by the support sections 20 and 21 protruded upward from the case 12. Here, since the case 12 is made of rigid sheet metal, and is secured to the vehicle body 1 tightly so that inflating airbag 39 may smoothly protrude from the opening 13a, the lower wall lower surface 64a of the box body 61 is securely supported by the support sections 20 and 21. Accordingly, even if heavy objects are housed in the box body 61, the box body 61 is prevented from deforming, and thus is able to keep good appearance. Especially, since the support sections 20 and 21 support the lower surface 64a of the lower wall 64 in the box body 61 widely in the transverse direction at the front edge 64c side and the rear edge 64d side, the box body 61 is stably supported.

[0066]

In the first embodiment, furthermore, the box body 61 is secured to the case 12 by means of the fixers 23, 24 and the fixing means 67

and 71, and then the case 12 includes the joint section 26 for joint to the vehicle body 1. In other words, the box body 61 is joined to the vehicle body 1 by means of the case 12. In the mounting work of the module 10 on the vehicle, accordingly, the container box 60 is secured to the body 1 by joining the individual joint sections 26 extending from the case 12 to the body 1, thus omitting a fixing work of the box 60 to the body 1. Here, since the case 12 is made of rigid sheet metal and is tightly secured to the body 1 so that the expanding airbag 39 may smoothly protrude from the opening 13a, the container box 60 is stably secured to the body 1 via the case 12.

[0067]

Besides, in the first embodiment, the lid 73 of the container box 60 is swingably supported by the pivot sections 28 formed in the rigid case 12 of the knee-protecting airbag device 11. Accordingly, stable opening/closing actions are secured. Without considering this effect, it will also be appreciated to form the pivot sections in the box body 61 to support the hinge arms 74 of the lid 73 for opening and closing the opening 61a.

[0068]

In the first embodiment, the box body 61 and the airbag cover 44 are separate entities. However, it will also be appreciated that a box body 61A and an airbag cover 44A may be made of an integral molded part 100 of synthetic resin, as in an occupant protection device S2 of the second embodiment shown in Figs. 14 and 15. In the molded part 100, an upper edge part of a general section 45 of the airbag cover 44A is continuously connected with a rear edge part of a lower wall 64 and a lower edge part of a flange 69 of the box body 61A so that the box body 61A and the airbag cover 44A is integral. In the molded

part 100, a region of the box body 61A is made from hard synthetic resin such as polypropylene, whereas a region of the airbag cover 44A is made from soft synthetic resin such as thermoplastic elastomer of olefin, and which soft and hard synthetic resin materials are compatible to each other. The cover 44A is made of soft material such that the doors 52 may turn smoothly around flexible hinge lines 53 when pushed by an inflating airbag 39.

[0069]

Since the general section 45 of the airbag cover 44A apart from the doors 52 in the transverse direction should be rigid rather than be soft, the general section 45 may be made from the same material as the box body 61A.

[0070]

As shown in Figs. 14 and 15, the box body 61A is not provided with fixing means 67 and 71 included in the box body 61, because the box body 61A is adapted to be coupled to the case 12 by joint walls 47 and 48 of the airbag cover 44A. However, the box body 61A may have fixing means 67 and 71 for fixture to fixers 24 and 23 of the case 12, provided that there is no problem in mounting the airbag cover 44A integrating the box body 61A on the case 12.

[0071]

The occupant protection device S2 of the second embodiment has a similar construction to the first embodiment except that the airbag cover 44A and the box body 61A are integral as part of the two-color molded part 100. Therefore, similar regions and parts to the first embodiment will be designated common reference numerals, and their descriptions will be omitted.

[0072]

With the construction of the occupant protection device S2 of the second embodiment where the airbag cover 44A and the box body 61A are formed into a single-piece as the two-color molded part 100, the number of components of the module 10A is reduced, and the mounting work of the module 10A itself is simplified. Assemblage of the module 10A is started by housing a folded airbag 39 and an inflator 31 in the case 12, as in the first embodiment. Then retaining legs 46 of the airbag cover 44A integral with the box body 61A are inserted in and retained at apertures 18b (not shown) of the case 12, and upper and lower joint walls 47 and 48 of the airbag cover 44A are joined with retainers 15U and 15D of the case 12 utilizing a locking member 16. Subsequently, a lid 73 is mounted to be supported by a pivot section 28 (not shown) utilizing pins 29 (not shown) of the case 12, and thus the module 10A is completed. Thereafter, the module 10A is mounted on a vehicle as the module 10 of the first embodiment.

[0073]

In the second embodiment, since the airbag cover 44A and the box body 61A of the container box 60 disposed above the airbag cover 44A are integral, it is prevented that the case 12 and so on of the knee-protecting airbag device 11 are seen by an occupant M in opening/closing operation of the lid 73. More specifically, if the airbag cover 44A and the box body 61A are separate entities, a gap may arise between them. In that case, the case 12 and so on of the knee-protecting airbag device 11 can be seen from the gap in such a time as opening/closing of the lid 73. In the second embodiment, however, since the rear edge part of the lower wall 64 and the lower edge part of the flange 69 of the box body 61A are continuous with the upper edge part of the airbag cover 44A, there arises no gap between the box body

61A and the airbag cover 44A, so that the case 12 and so on of the knee-protecting airbag device 11 are prevented from being seen by the occupant M.

[0074]

It will also be appreciated to adopt a construction of an occupant protection device S3 of the third embodiment shown in Figs. 16 and 17. In the third embodiment, an airbag device 80A for a front passenger's seat having an airbag 91 for protecting the upper body MU of the occupant M is also assembled as part of a module 10B to be mounted on the vehicle. In the airbag device 80A for a front passenger's seat, a bracket 84A of a case 81A to be secured to the dashboard reinforcement 2 includes joint pieces 84a to be coupled with a plurality of joint pieces 61b of a box body 61B by means of bolts 86. The airbag device 80A for a front passenger's seat is connected with the knee-protecting airbag device 11 by means of the joint pieces 84a, and thus formed into the module 10B. An airbag cover 95A differs from the airbag cover 95 of the first embodiment in not having fastening legs 96a. In the occupant protection device S3 of the third embodiment, remaining members and regions are similarly arranged to those in the second embodiment.

[0075]

To assemble the module 10B of the third embodiment, a folded airbag 39 and an inflator 31 are housed in a case 12 firstly as in the second embodiment, and then not-shown retaining legs 46 of an airbag cover 44A integral with a box body 61B are inserted in and held at not-shown apertures 18b of the case 12, while upper and lower joint walls 47 and 48 of the airbag cover 44A are joined with retainers 15U and 15D of the case 12 by means of a locking member 16. Subsequently, not-shown pins 29 are used to pivotally hold a lid 73 at not-shown pivot sections

28 of the case 12. Thereafter, by bolt 86 fixing of the joint pieces 84a of the already assembled airbag device 80A for a front passenger's seat to the joint pieces 61b, the module 10B is completed.

[0076]

The module 10B thus assembled is mounted on the vehicle through processes of not-shown bolt 27 fixing of not-shown joint sections 26 of the case 12 of the knee-protecting airbag device 11 to a not-shown bracket 3 of the vehicle body 1, and bolt 85 fixing of the bracket 84 of the airbag device 80A for a front passenger's seat to a bracket 2a of the vehicle body 1. Thereafter, as shown in Fig. 17, the dashboard 6 is mounted on the vehicle by bolt 72 fixing of the dashboard body 7 and attaching a decoration cover 8, and an undercover 4 is fitted in a predetermined position. Thus, the occupant protection device S3 is mounted on the vehicle.

[0077]

In the third embodiment, further less working processes are required and the tact time per vehicle is reduced in comparison with a case of mounting the knee-protecting airbag device 11, the container box 60 and the airbag device 80A for a front passenger's seat separately. Moreover, mounting workability of components arranged in front of a front passenger's seat PS (the knee-protecting airbag device 11, the container box 60 and the airbag device 80A) is improved, too.

[0078]

If an airbag cover 95A of the airbag device 80A for a front passenger's seat is configured in the same way as the airbag cover 95 of the first embodiment, the following arrangement may be adopted. More specifically, the module 10B not having the airbag cover 95 is mounted on the vehicle firstly. Then the dashboard 6 is attached to the vehicle,

and the airbag cover 95 is pushed into an opening 6a of the dashboard 6 from upper side, while having the legs 96a retained at the opening 6a periphery, and having hooks 82a retained in holes 98a so that the airbag cover 95 is attached to a circumferential wall portion 82 of a case 81A. Of course, the airbag cover 95 in the airbag device for a front passenger's seat in this case may be formed integral with the dashboard 6 utilizing two-shot molding or the like.

[0079]

Alternatively, the module may include the dashboard 6 as a decoration member disposed in front of a front passenger's seat, as a mounting module 10C of a fourth embodiment S4 of the occupant protection device shown in Fig. 18.

[0080]

The module 10C of the fourth embodiment utilizes a single bracket 102 to assemble a knee-protecting airbag device 11, a container box 60, and an airbag device 80 for a front passenger's seat into a single piece. The bracket 102 has bolts 33d of the inflator 31 in the knee-protecting airbag device 11 inserted into itself and fastened with nuts 34 to support the airbag device 11. Joint pieces 61b of the box body 61B are bolt 86 fixed to the bracket 102, whereas a bracket 84 of the airbag device 80 for a front passenger's seat is bolt 85 fixed to the bracket 102. Moreover, the bracket 102 includes a support piece 102a to which the body 7 of the dashboard 6 is bolt 103 fixed.

[0081]

To assemble the module 10C, a folded airbag 39 and an inflator 31 are housed in a case 12 firstly as in the second and third embodiments, and then not-shown retaining legs 46 of an airbag cover 44A integral with the box body 61B are inserted in and held at not-shown apertures

18b of the case 12, while upper and lower joint walls 47 and 48 of the airbag cover 44A are joined with retainers 15U and 15D of the case 12 by means of a locking member 16. Subsequently, not-shown pins 29 are used to pivotally hold a lid 73 at not-shown pivot sections 28 of the case 12. Thereafter, the case 12 is nut 34 fixed to the bracket 102, whereas the box body 61B is bolt 86 fixed to the bracket 102. By attaching the bracket 84 of the assembled airbag device for a front passenger's seat 80 to the bracket 102 by the bolt 85 and bolt 103 fixing the dashboard body 7 thereto, the module 10C is completed. To mount the module 10C on the vehicle, not-shown joint sections 26 of the case 12 is secured to a not-shown bracket 3 of the vehicle body 1 as in the first embodiment, and the bracket 102 itself is secured to a bracket 2a by means of a bolt 104. If an undercover 4 then is fitted in position, the occupant protection device S4 is mounted on the vehicle. Here, fixing work of the bolt 104 is performed through an opening 7b which is covered by the cover 8 of the dashboard body 7, and the cover 8 will be located therein after the fixing work.

[0082]

With this construction, working processes and the tact time per vehicle are further reduced in comparison with a case where the knee-protecting airbag device 11, the container box 60, the airbag device 80 for a front passenger's seat, and the dashboard 6 as an interior decoration member are mounted on the vehicle separately. Moreover, mounting workability of parts arranged in front of the front passenger's seat PS (the knee-protecting airbag device 11, the container box 60, the airbag device 80 and the dashboard 6) is further improved, too. In addition, these parts (the knee-protecting airbag device 11, the container box 60, the airbag device 80 and the dashboard 6) are assembled

into a single piece of module before being mounted on the vehicle, less extra space is needed in the mounting direction which would otherwise be required when mounting individual parts separately. Consequently, more interior space is secured in front of the front passenger's seat PS.

[0083]

When a dashboard is included in the module to be mounted on the vehicle, the construction of a module 10D shown in Fig. 19, which constitutes an occupant protection device S5 of the fifth embodiment, may be adopted. In the module 10D, a dashboard 6A as an interior decoration member, a box body 61C, an airbag cover 44B for the knee-protecting airbag device 11 and an airbag cover 95B for the airbag device 80 for a front passenger's seat are molded into a single-piece two-color part 100A made of synthetic resin. In the two-color part 100A, regions of the airbag covers 44B and 95B are made from soft synthetic resin exemplified by thermoplastic elastomer of olefin, whereas remaining regions including the dashboard 6A and the box body 61C is made from hard synthetic resin such as polypropylene. The soft and hard synthetic resin materials are compatible to each other. In this case, too, since a general section 45 (not shown) of the airbag cover 44B apart from doors 52 in the transverse direction should have rigidity, it may be made from the same material as the box body 61C.

[0084]

To assemble the module 10D, a folded airbag 39 and an inflator 31 are housed in a case 12 firstly, and not-shown retaining legs 46 of the airbag cover 44B are inserted in and held at not-shown apertures 18b of the case 12, while upper and lower joint walls 47 and 48 of the airbag cover 44B are joined with retainers 15U and 15D of the case 12

by means of a locking member 16. Subsequently, not-shown pins 29 are used to pivotally hold a lid 73 at not-shown pivot sections 28 of the case 12. Thereafter, the case 12 is nut 34 fixed to a bracket 102A, and the box body 61C is bolt 86 fixed to the bracket 102A. By attaching a case 81 housing a folded airbag 91 and an inflator 87 to the airbag cover 95B integral with the dashboard 6A by means of hooks 82a and retaining holes 98a, the module 10D is completed.

[0085]

To mount the module 10D on the vehicle, not-shown joint sections 26 of the case 12 is secured to not-shown bracket 3 of the vehicle body 1 as in the first embodiment. Then the bracket 102A itself is secured to a bracket 2a by means of a bolt 104, and a bracket 84 of the airbag device 80 for a front passenger's seat is bolt 85 fixed to the bracket 2a. If an undercover 4 then is fitted in position, the occupant protection device S5 is mounted on the vehicle. Here, the fixing work of the bolts 84 and 104 is performed with the lid 73 open, and with a cap 61c in the box body 61C removed. The cap 61c is relocated therein after the fixing work.

[0086]

Although the fifth embodiment employs the bracket 102A, the bracket 102A may be omitted since the bracket 84 of the airbag device 80 for a front passenger's seat and the case 12 of the knee-protecting airbag device 11 are secured to the vehicle body 1 by bolts 27 and 85 when mounting the module 10D on the vehicle, such that the mounting strength to the body 1 is retained.

[Brief Description of the Drawings]

Fig. 1 is a front view of an occupant protection device according to the first embodiment as mounted on the vehicle, as viewed from rearward

of the vehicle;

Fig. 2 is a schematic vertical section of the occupant protection device of the first embodiment as mounted on the vehicle, taken along the front-rear direction of the vehicle;

Fig. 3 is a schematic enlarged vertical section of the occupant protection device of the first embodiment as mounted on the vehicle, taken along the front-rear direction of the vehicle;

Fig. 4 is a schematic front view of a mounting module in the occupant protection device of the first embodiment;

Fig. 5 is a schematic vertical section of the mounting module of the first embodiment as mounted on the vehicle;

Fig. 6 is a cross section of the mounting module of the first embodiment, taken along line VI-VI in Fig. 4;

Fig. 7 is a schematic enlarged vertical section of a knee-protecting airbag device of the first embodiment;

Fig. 8 is a schematic enlarged cross section of the knee-protecting airbag device of the first embodiment;

Fig. 9 is a schematic vertical section showing the joined condition of the knee-protecting airbag device of the first embodiment and the vehicle body, taken along line IX-IX in Fig. 4;

Fig. 10 is a schematic vertical section showing the joined condition of a case for the knee-protecting airbag device and a box body of a container box of the first embodiment, taken along line X-X in Fig. 4;

Fig. 11 is a schematic vertical section showing the way a lid of the container box in the first embodiment is supported, taken along line XI-XI in Fig. 4;

Fig. 12 is an exploded perspective view of the container box and

the case of knee-protecting airbag device in the mounting module of the first embodiment;

Fig. 13 is a vertical section of the mounting module of the first embodiment;

Fig. 14 is a vertical section of a mounting module of an occupant protection device according to the second embodiment;

Fig. 15 is a perspective view of a molded part of the second embodiment in which a box body and an airbag cover are integrally molded;

Fig. 16 is a schematic vertical section of the mounting module of the third embodiment;

Fig. 17 is a schematic vertical section of an occupant protection device of the third embodiment as mounted on the vehicle;

Fig. 18 is a schematic vertical section of an occupant protection device of the fourth embodiment as mounted on the vehicle; and

Fig. 19 is a schematic vertical section of an occupant protection device of the fifth embodiment as mounted on the vehicle.

[Description of the Reference Numerals]

1 ... vehicle body

6 ... (interior decoration member) instrument panel, or dashboard

10, 10A, 10B, 10C, 10D ... mounting module

11 ... knee-protecting airbag device

12 ... case

13a ... opening

20, 21 ... support portion

23, 24 ... fixer

26 (26A, 26B, 26C) ... joint section

31 ... inflator

39 ... airbag

44, 44A, 44B ... airbag cover
60 ... container box
61, 61A, 61B, 61C ... box body
61a ... opening
64a ... lower surface
80, 80A ... airbag device for a front passenger's seat
91 ... airbag
100, 100A ... single-piece molded part
PS ... front passenger's seat
M ... vehicle occupant
K (KL, KR) ... knee
MU ... upper body
S1, S2, S3, S4, S5 ... occupant protection device



Fig. 1

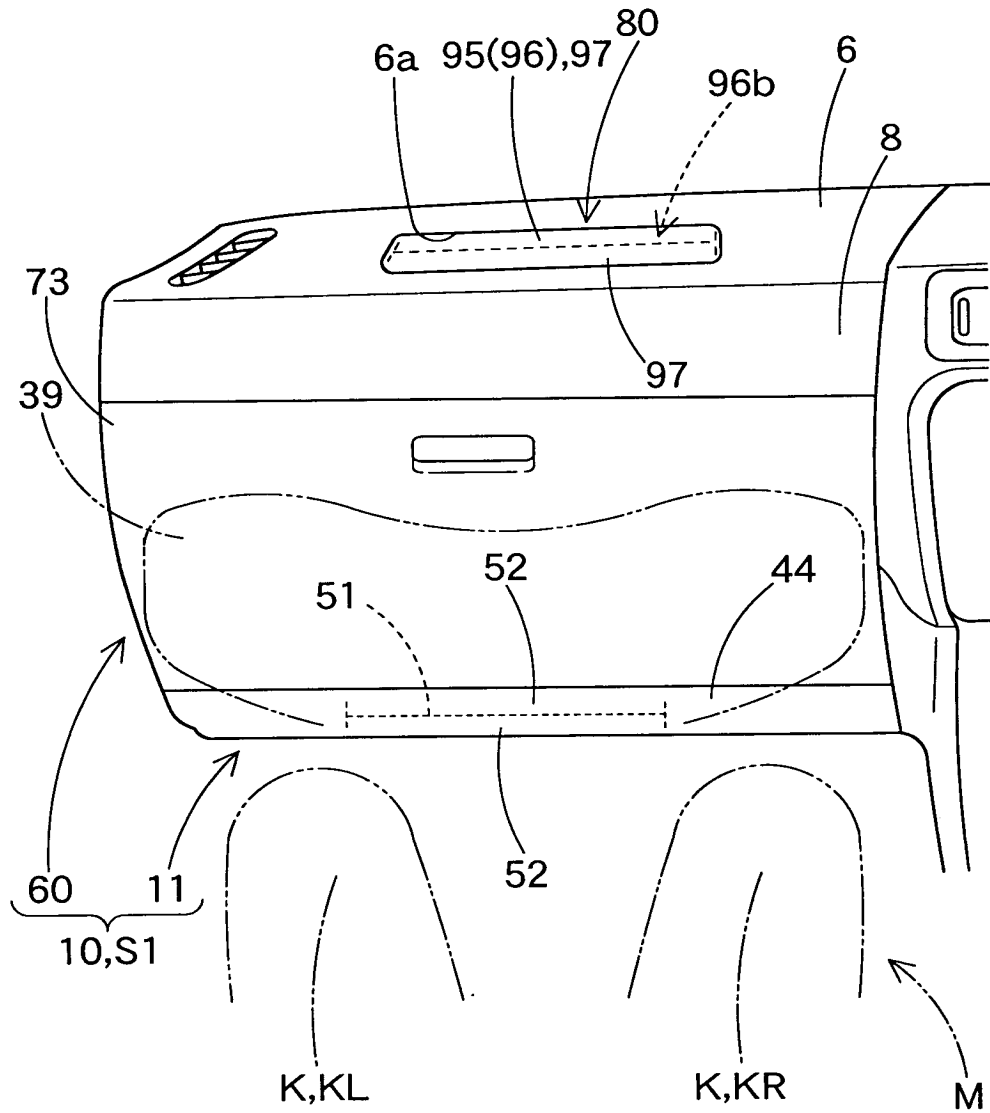
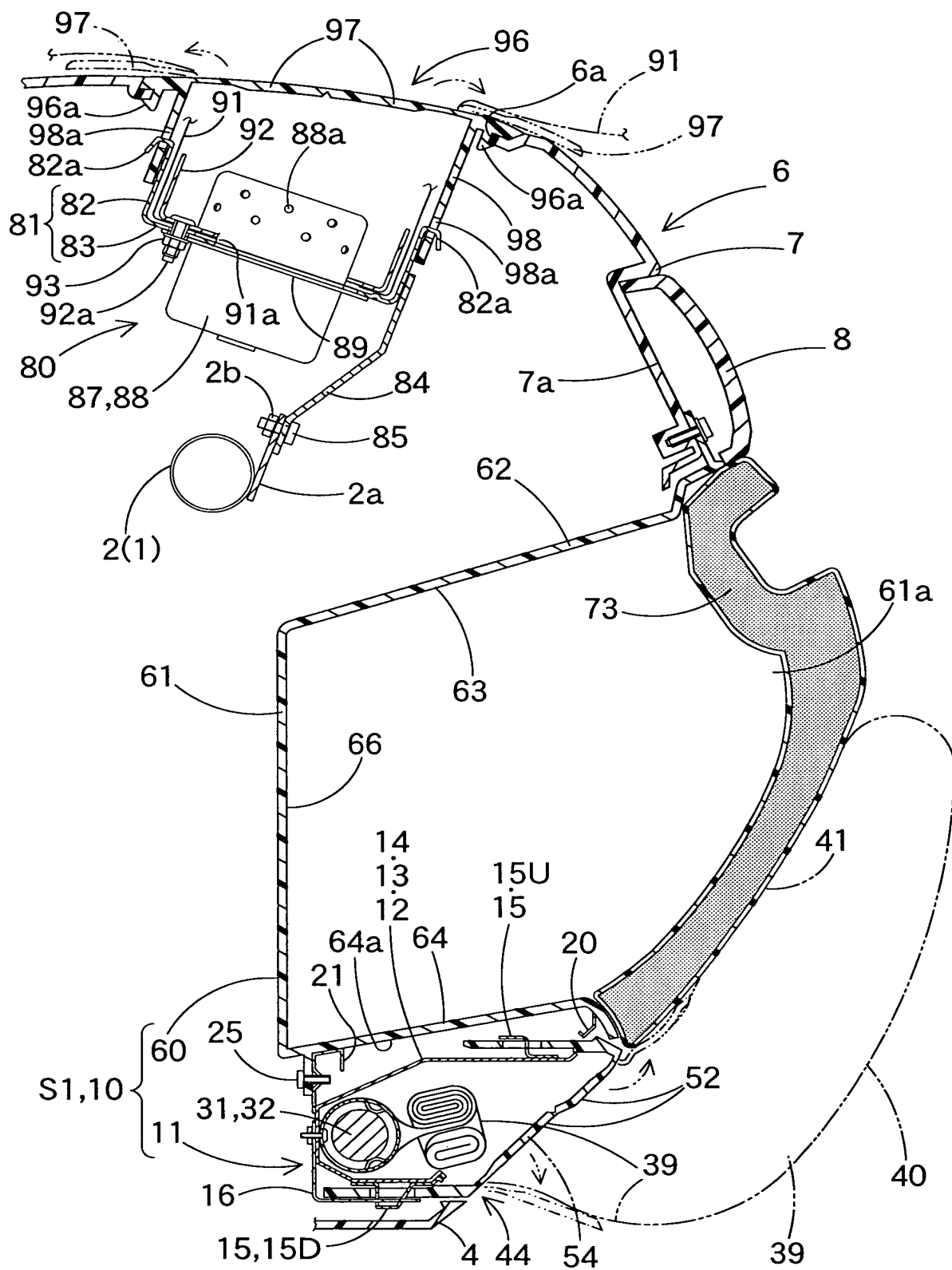


Fig. 3



F i g . 4

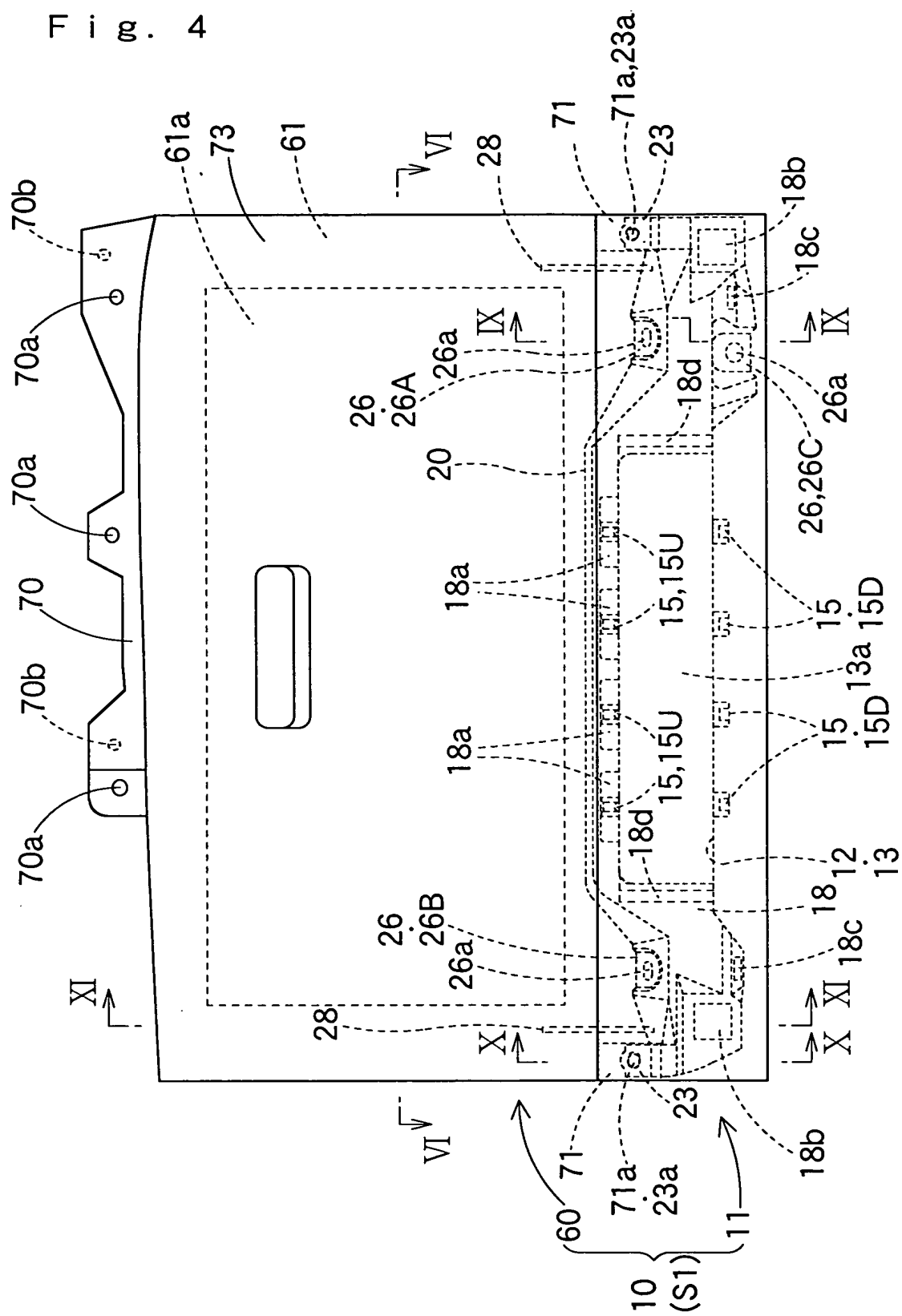
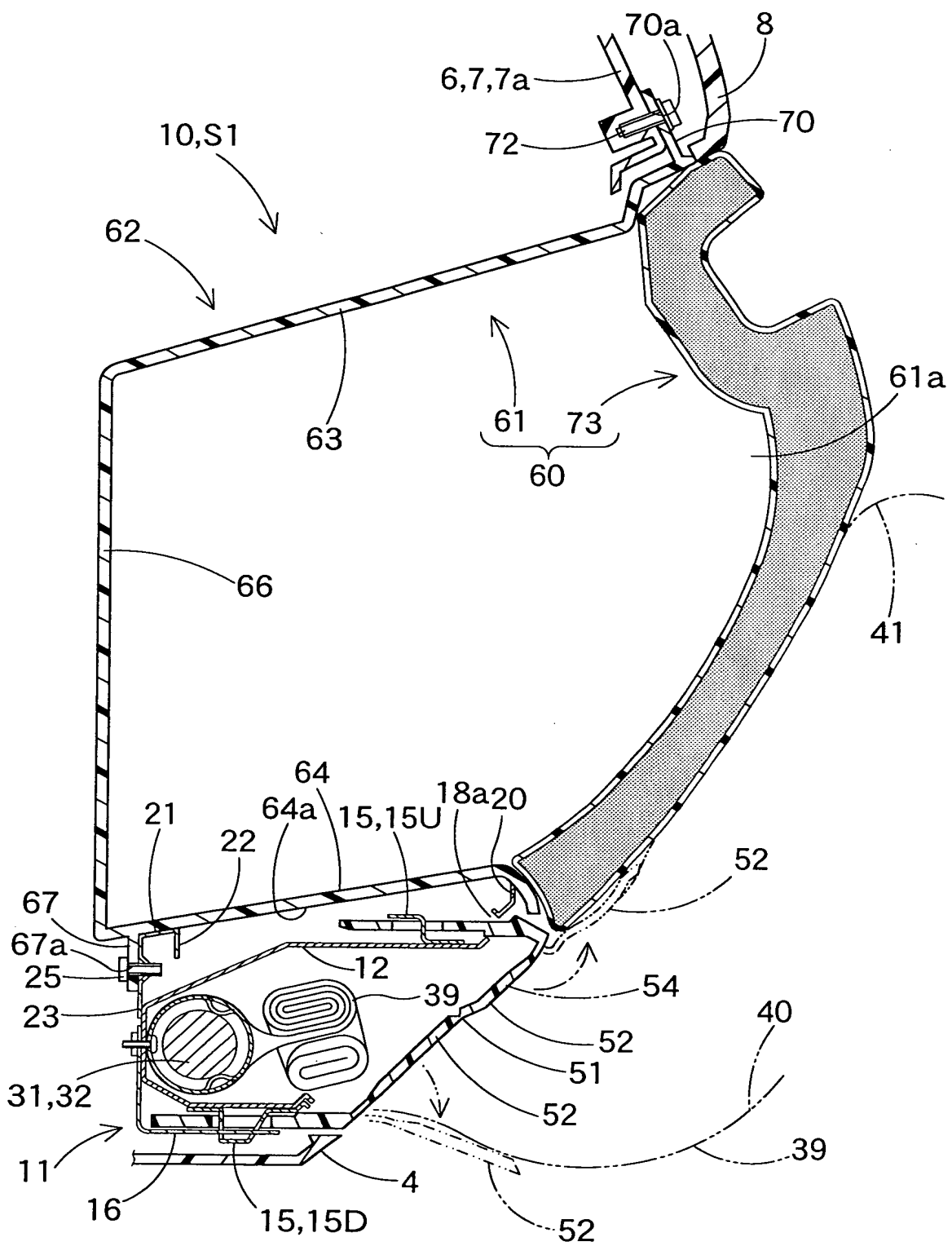


Fig. 5



F i g . 6

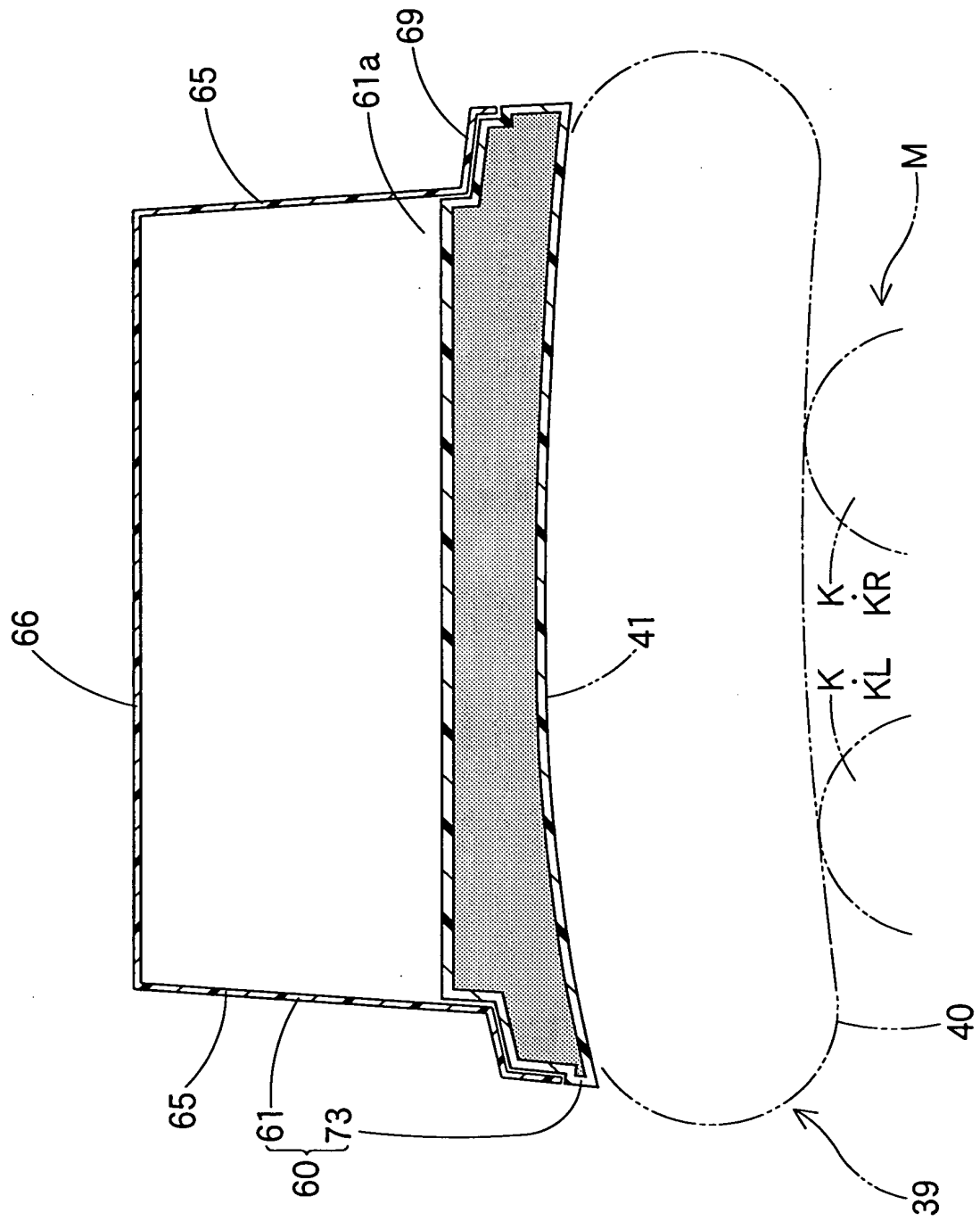


Fig. 7

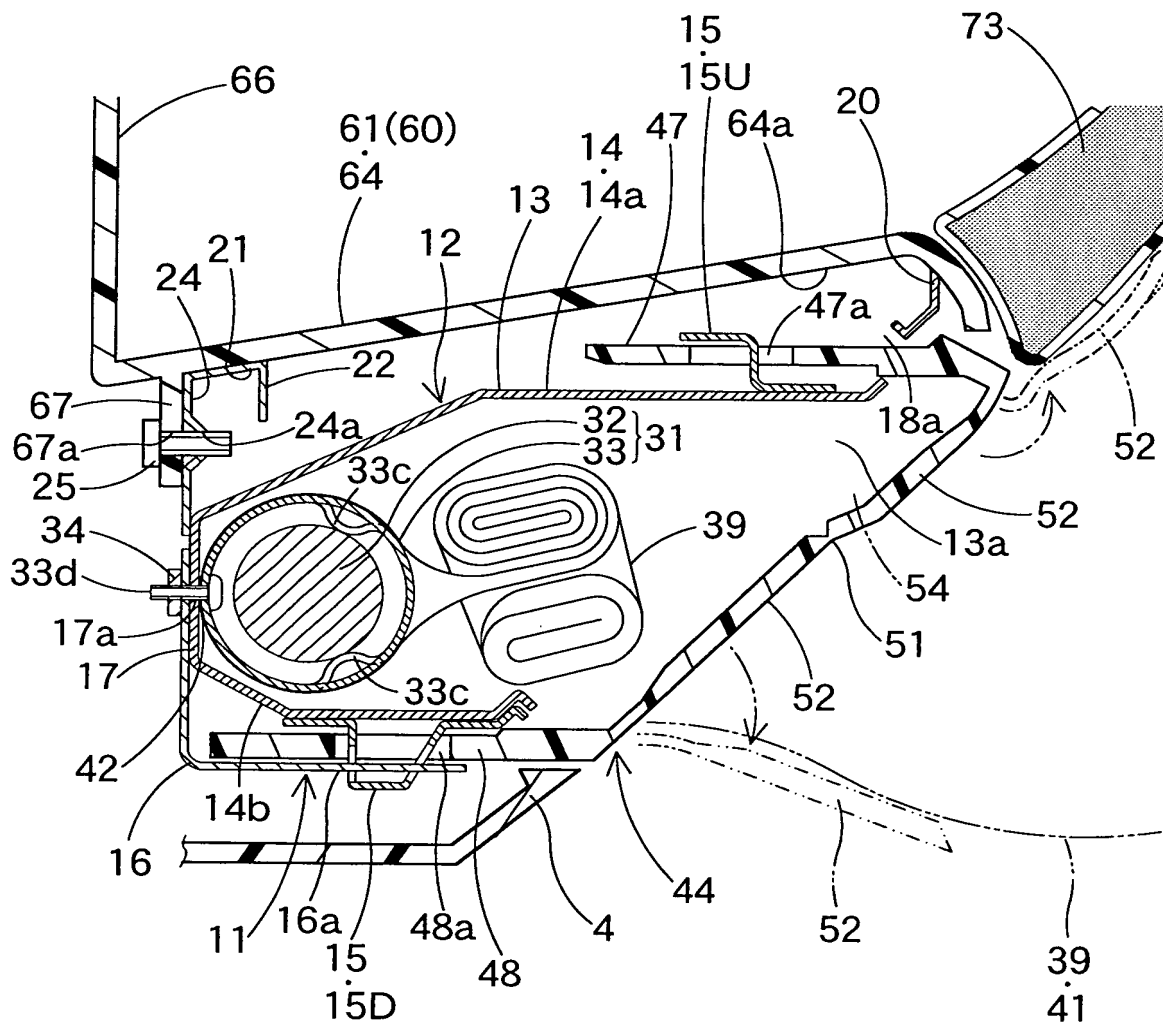
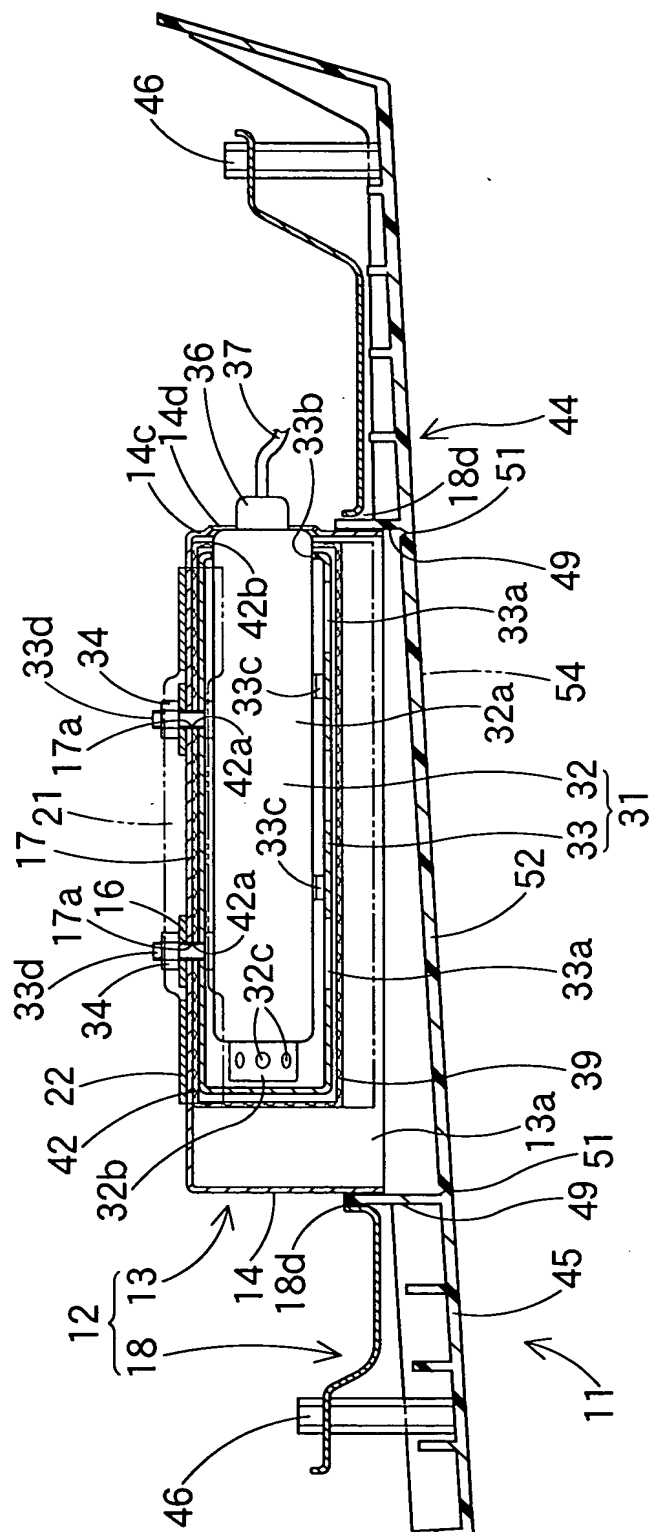


Fig. 8



F i g . 9

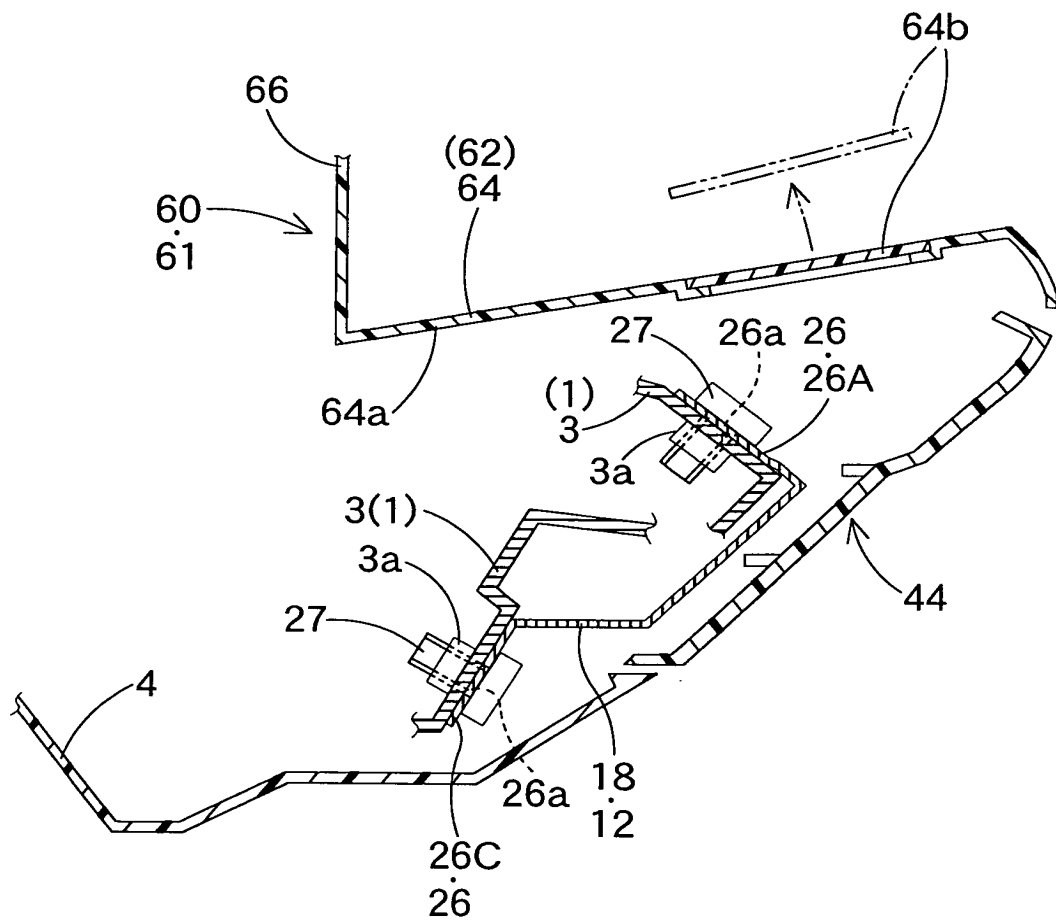


Fig. 10

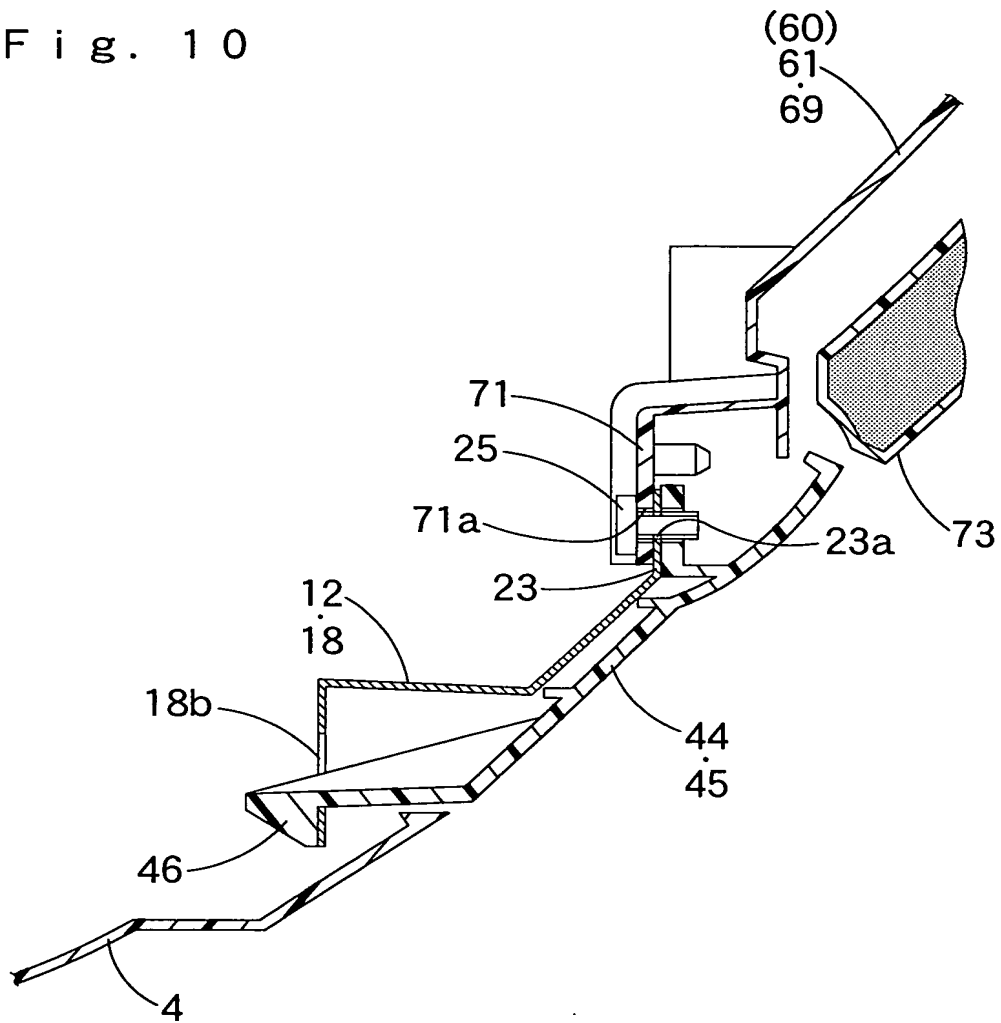


Fig. 11

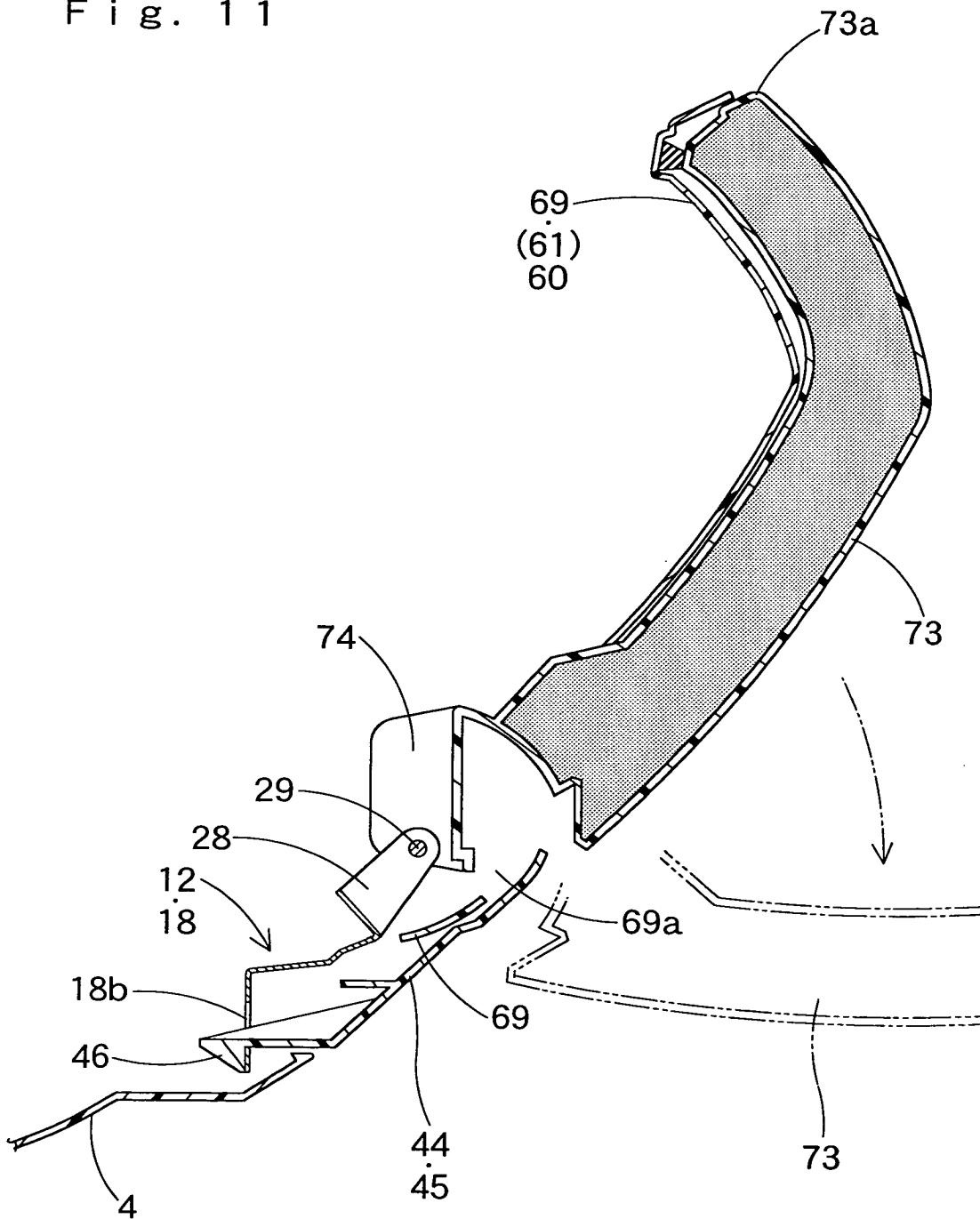


Fig. 12

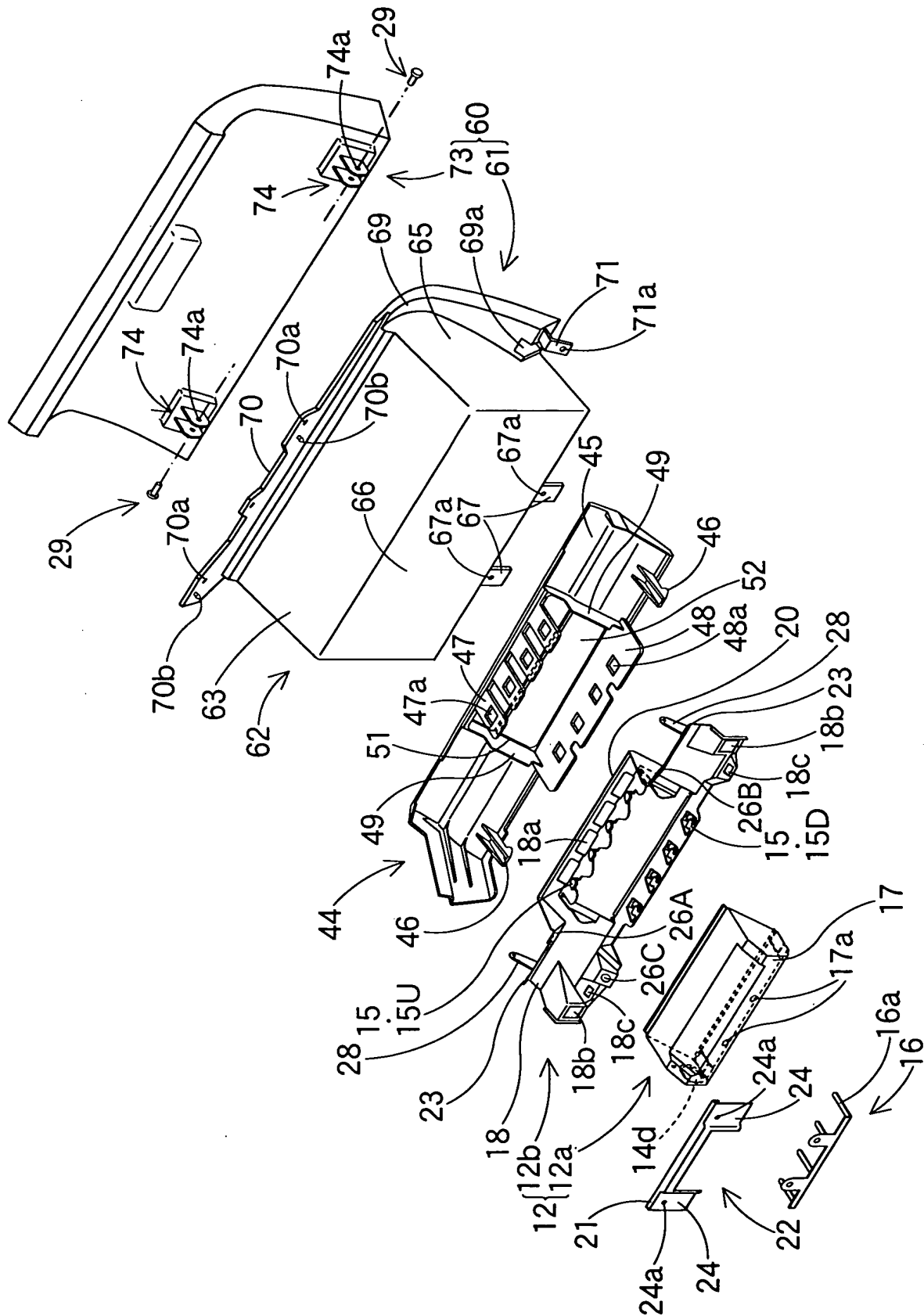


Fig. 13

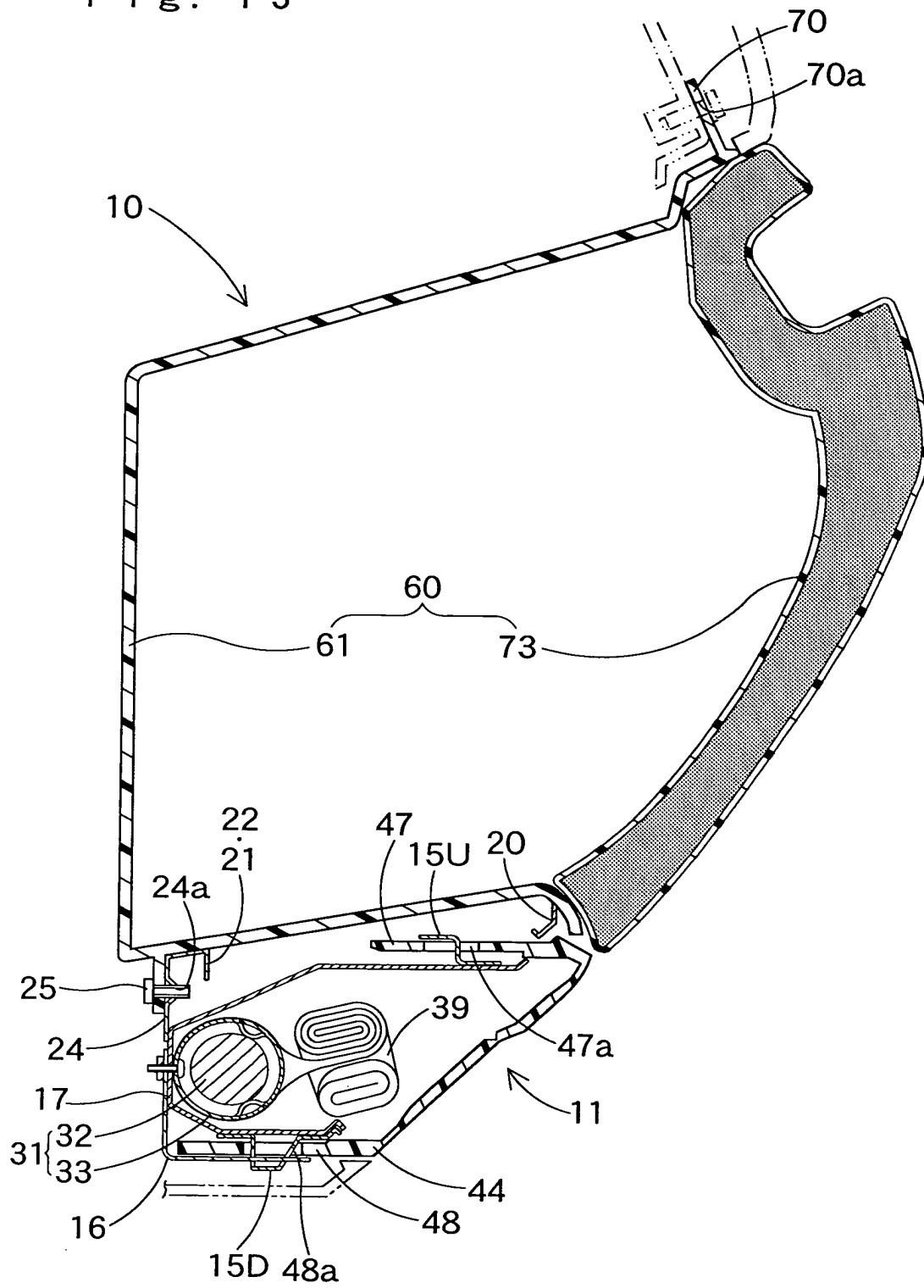


Fig. 14

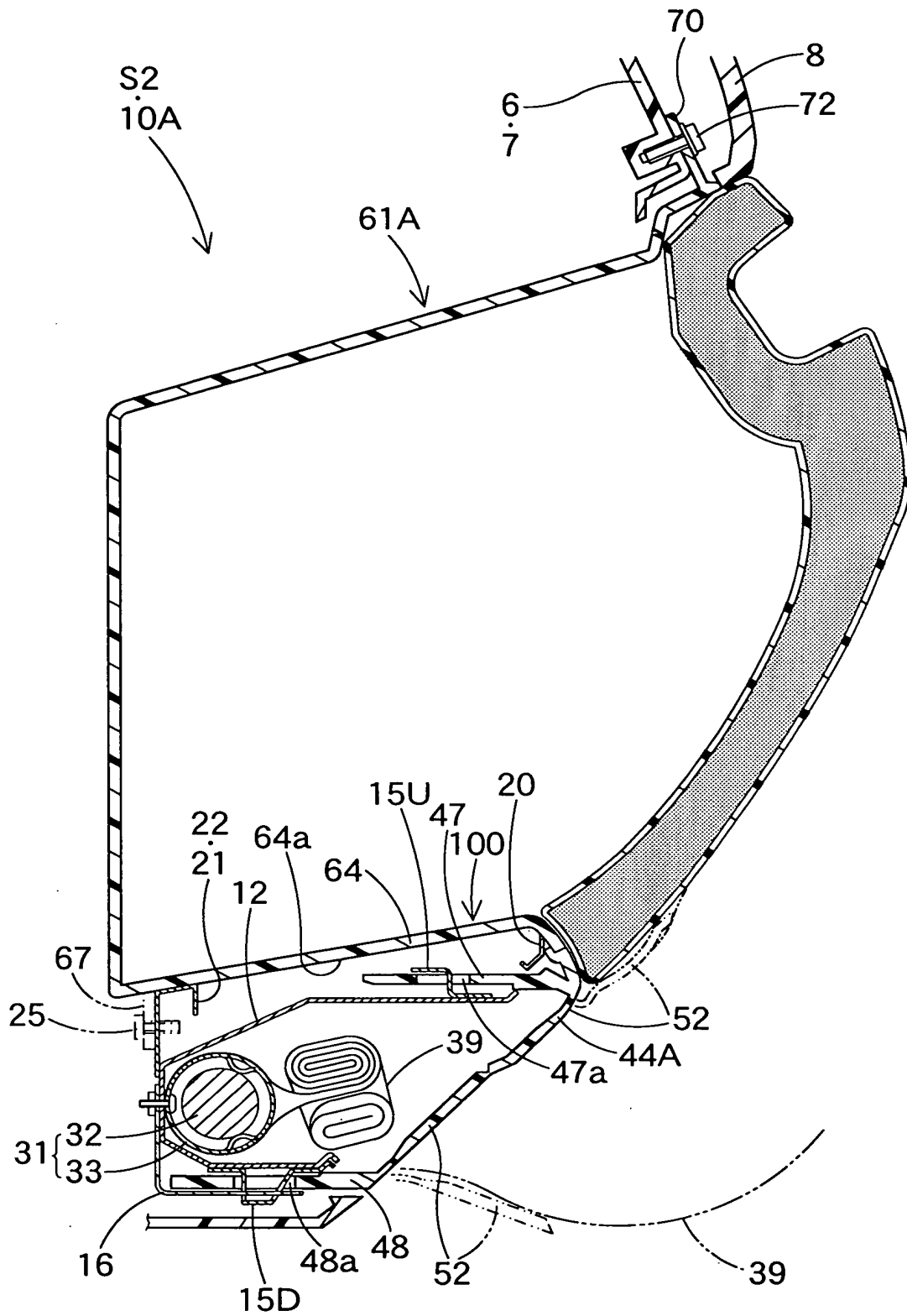


Fig. 15

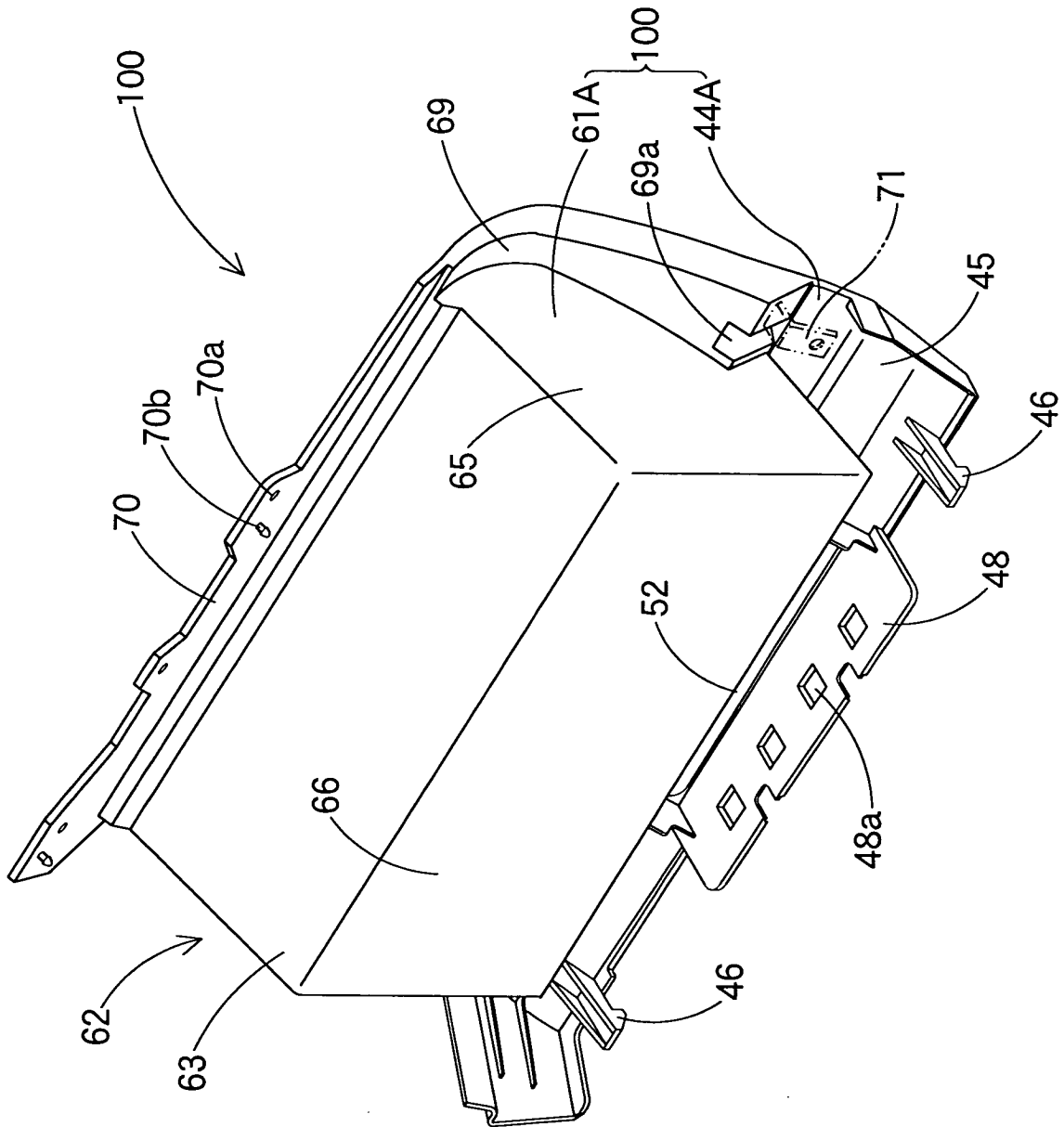


Fig. 16

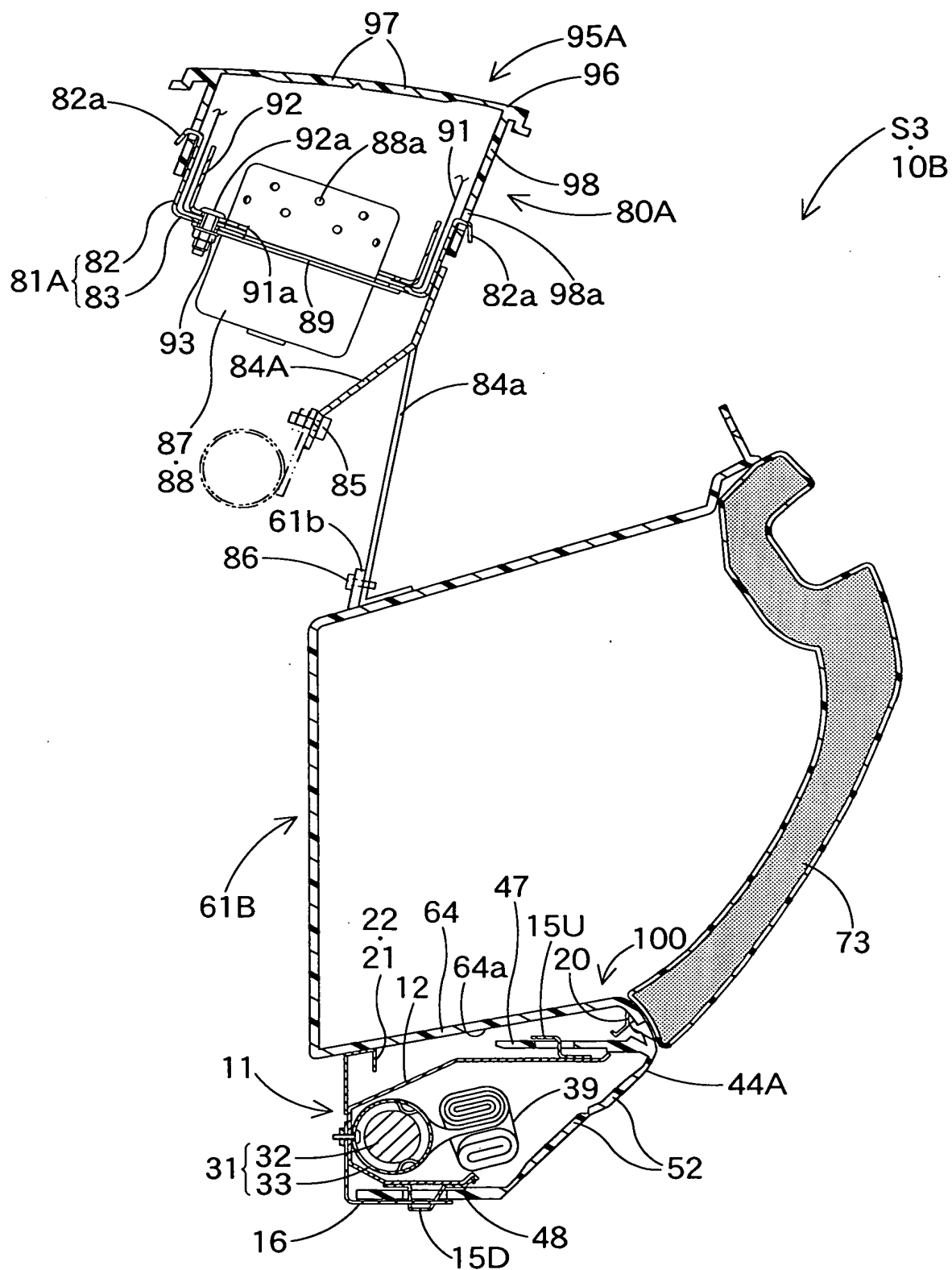


Fig. 17

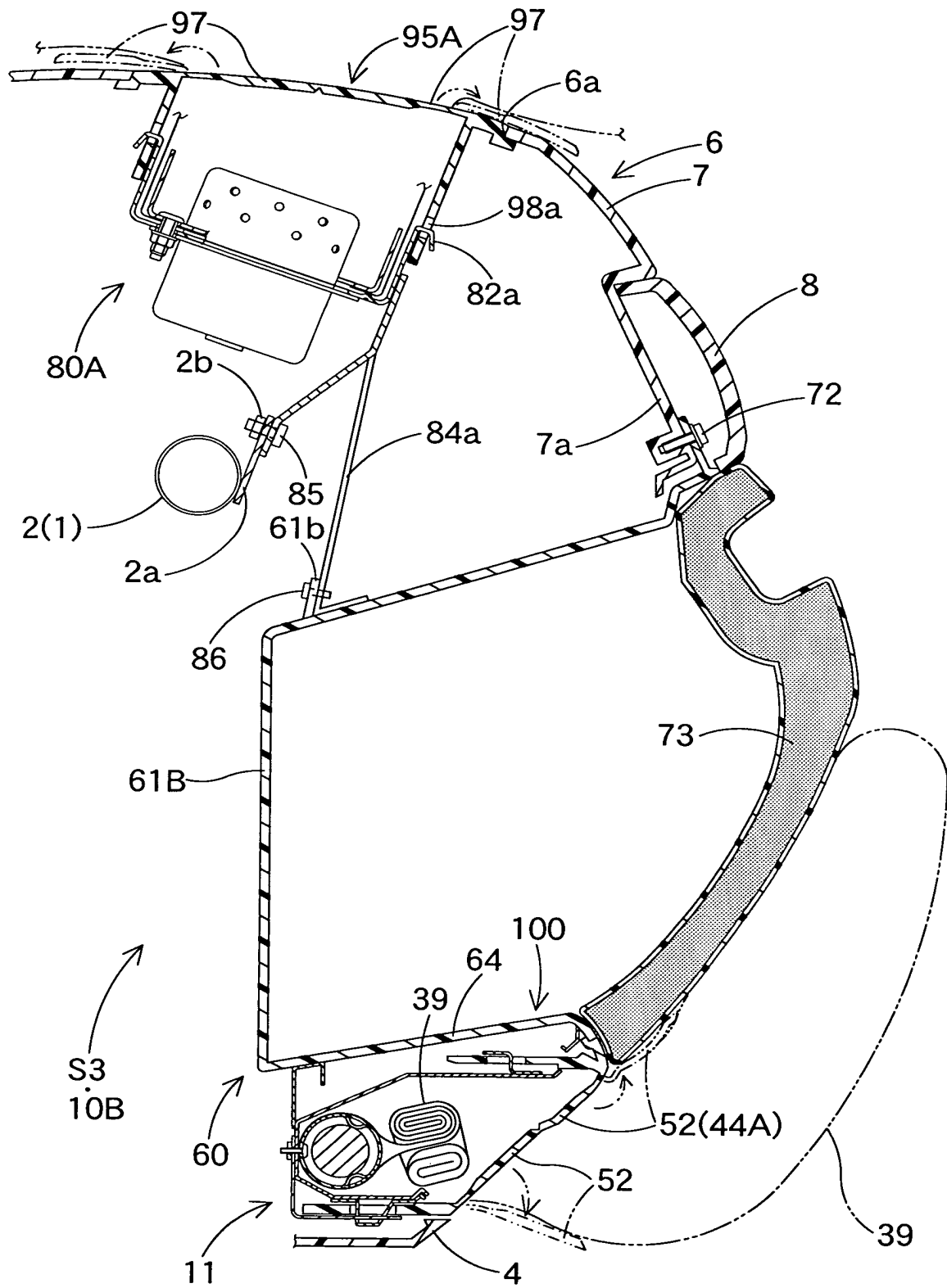


Fig. 18

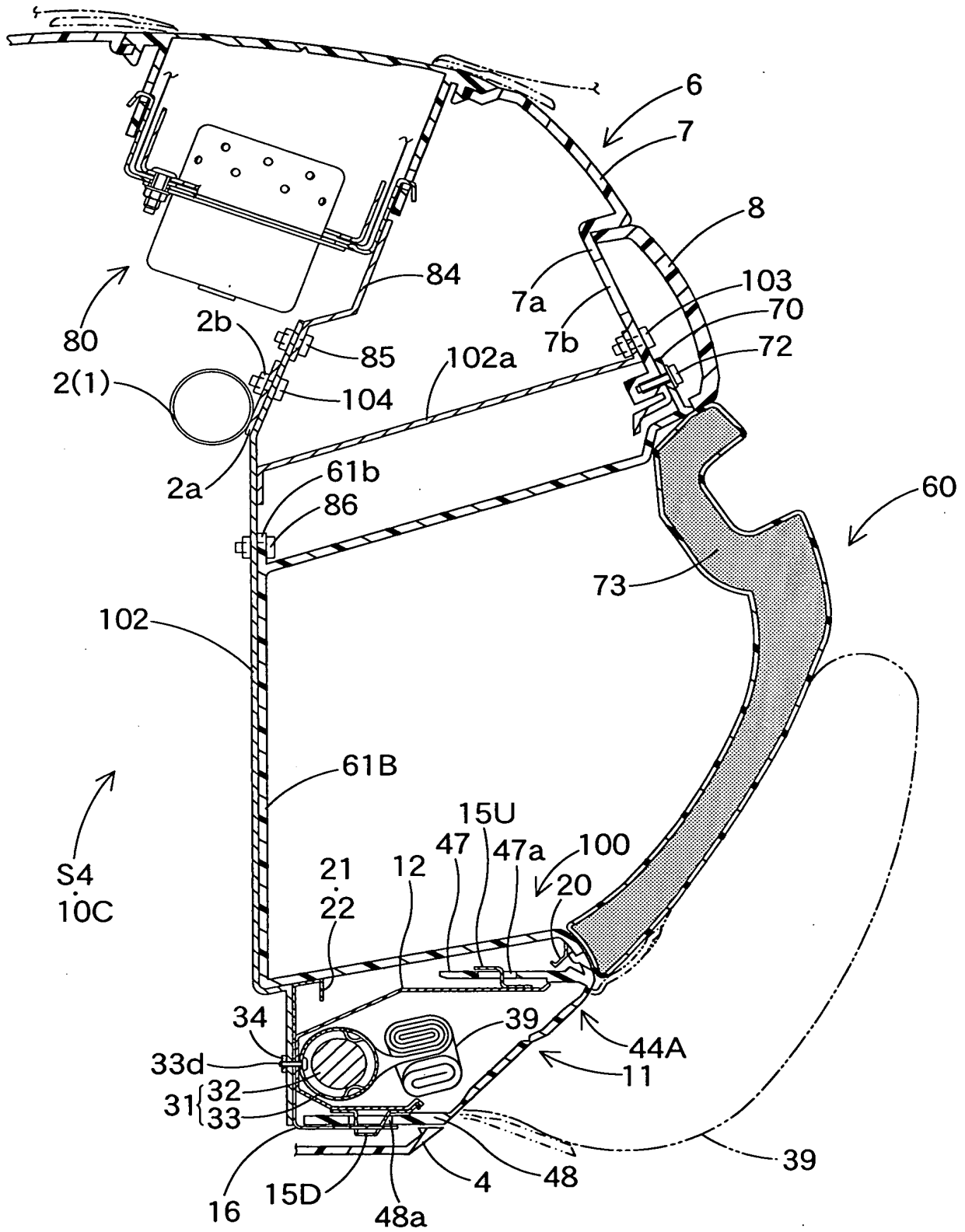
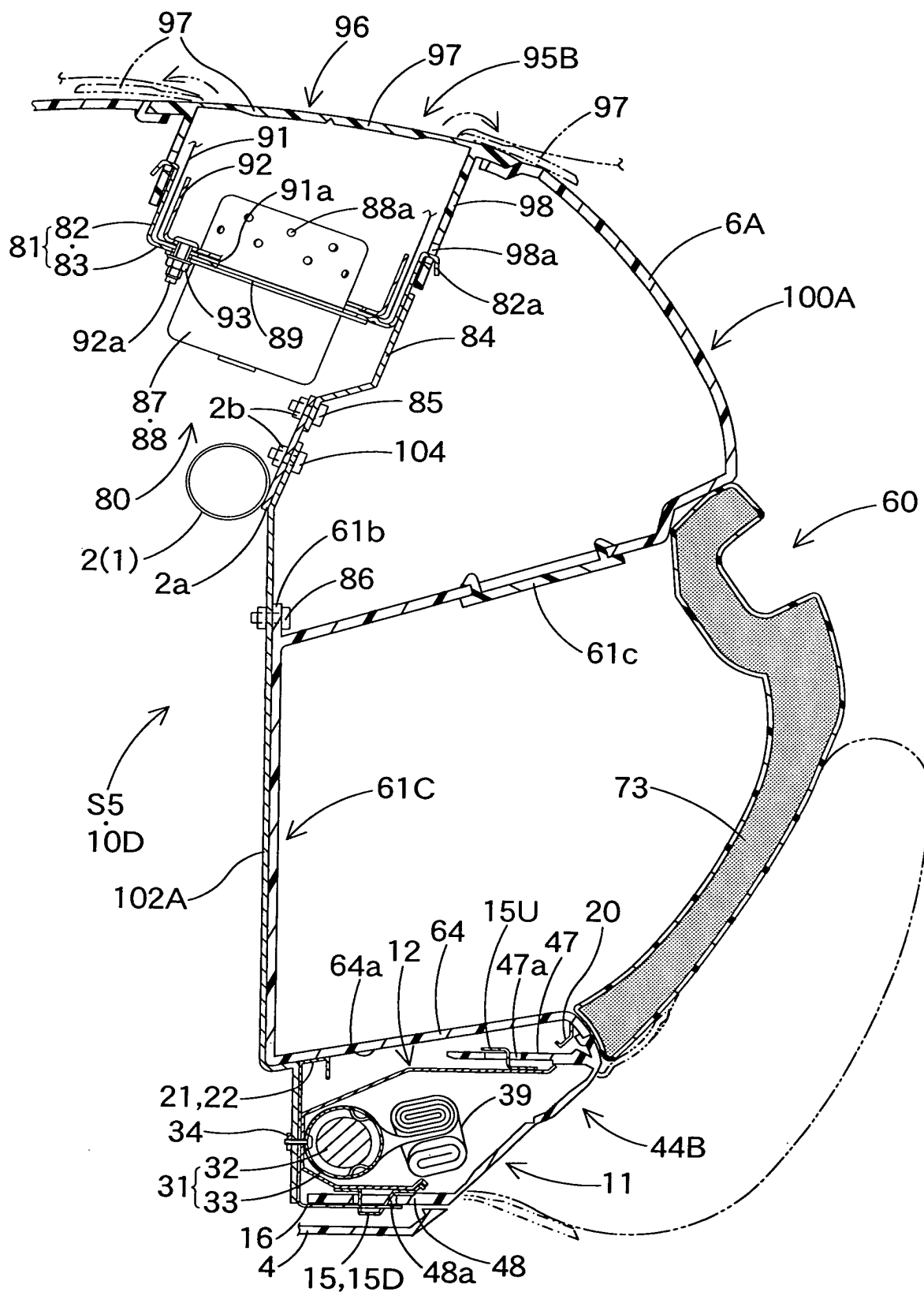


Fig. 19



[Name of the Document]

Abstract of the Disclosure

[Abstract]

[Task] To provide an occupant protection device capable of preventing the tact time per vehicle from increasing even if a container box is mounted in front of the front passenger's seat while the device aims to protect knees of an occupant seated in the front passenger's seat.

[Means of Solving the Problem]

The occupant protection device S1 includes a knee-protecting airbag device 11 and a container box 60. The airbag device 11 has an airbag 39 for protecting knees K of a vehicle occupant M in the front passenger's seat PS, an inflator 31, a case 12 for housing the airbag and the inflator, and which is opened rearward, and an airbag cover 44. The box 60 includes a box body 61 and a lid 73. Before being mounted on the vehicle, the knee-protecting airbag device 11 and the container box 60 are assembled to form a mounting module 10. By mounting the module 10 on the vehicle, the knee-protecting airbag device 11 and the container box 60 are mounted on the vehicle.

[Selected Drawing]

Fig. 2

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